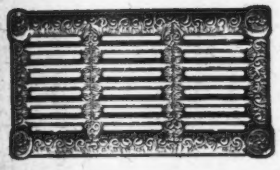
HEATING AND VENTILATION OF PRINCETON THEOLOGICAL SEMINARY

THE HEATING AND VENTILATING MAGAZINE

VOL. V., NO. 6 NEW YORK, JUNE, 1908 $1.00 a year, 10 cents a copy

GURNEY HEATERS
FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER
THEY GIVE ENTIRE SATISFACTION · SEND FOR CATALOGUE.
GURNEY HEATER MANUFACTURING CO.
NEW YORK OFFICE 12 E 42ND ST. 188-200 FRANKLIN ST. BOSTON.

KIELEY
Kieley & Mueller
34 West 13th Street
New York City, N. Y.
Reducing Valves and Steam Traps for all services; Damper Regulators, Back Pressure and Relief Valves, Grease Extractors and Steam Separators, Pump Governors, Pump Regulators, Float Valves, Water Arches, Hot Water Temperature Controllers, Water Feeders, etc.
Steam Specialties



FOWLER & WOLFE MANUFACTURING CO.
ORIGINATORS OF WALL RADIATION
Bourse Building, Philadelphia, Pa.
WE GUARANTEE OUR WALL RADIATION:
To contain the rated surfaces.
To have been tested at 100 lbs. pressure before shipment.
To provide for perfect circulation when installed in either vertical or horizontal form.
We challenge any other manufacturers of wall radiation to equal the above guarantee.

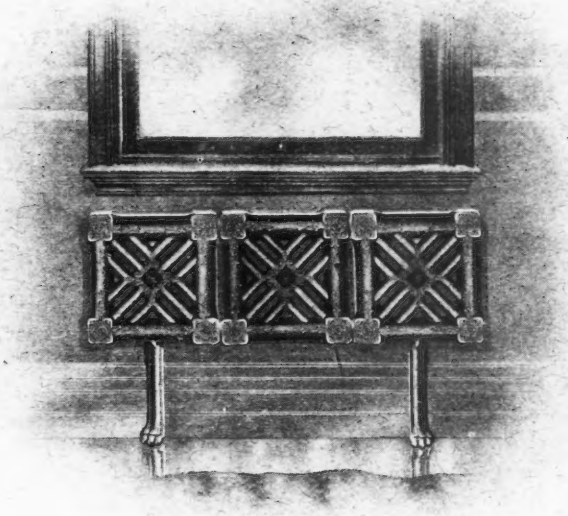
THOMAS F. CUSHING CO.
IRON AND STEEL PIPE
40 EAST 21st ST. Between Broadway and Fourth Ave. NEW YORK

THE COVERING AND SUPPLY CO.
Manufacturers, Dealers and Contractors in
ASBESTOS MATERIALS
STEAM PIPE AND BOILER COVERINGS
OF EVERY DESCRIPTION
OFFICE and WAREROOMS
232 WEST ST., NEW YORK

STANDARD TEMPERATURE REGULATION CO.
WEST STREET BUILDING, WEST AND CEDAR STS., NEW YORK
AUTOMATIC HEAT REGULATION

Entered as second-class matter at the Post-Office in New York, N. Y. Copyright, 1908, by A. S. Armagnac

X-RAY
WALL RADIATOR



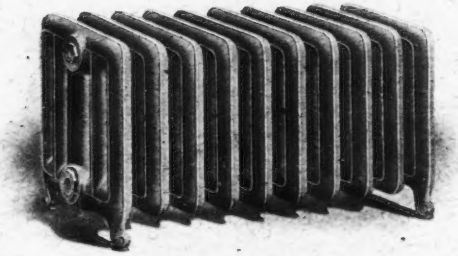
Made in 5-foot and
8-foot Sections

THE H. B. SMITH CO.
Westfield, Mass.

728 Arch St.
PHILADELPHIA

39 East Houston St.
NEW YORK

139 Washington St. No.
BOSTON



FIVE COLUMN PRINCESS
WINDOW RADIATOR
12, 14 and 16 inches High

PACIFIC COAST AGENTS

Holbrook, Merrill
and Stetson
LOS ANGELES and
OAKLAND, CAL.

EUROPEAN AGENTS

August Eggers
BREMEN and NEW YORK

Pipe, Fittings, Valves and Engineering Specialties

Automatic Air Valves

TRADE (S) MARK

Double Connection
Circulating
Syphon Action

A Guaranteed Valve

No. 1. Price, $1.15
Side Outlet, with Cap

No. 6. Price, $1.35
Side Outlet—Lock Shield

No. 3. Price, $1.15
Bottom Outlet, ⅛ or ¼ inch

These valves are the best made in every respect. Small holes and tubes are avoided, to prevent clogging. Being fitted with Double passages into the Radiator, all danger of throwing water and water clogging is eliminated. The Expansion post is made of an indestructible, highly sensitive compound, insuring quick action. The Workmanship is perfect, the Plating extra heavy and every valve tested and guaranteed for five years.

JOHN SIMMONS CO.

OFFICES AND SALESROOMS
110 Centre Street, New York

When writing mention Department E

MACHINE SHOP	FACTORIES AND SHOPS	DOCK
48 to 58 Baxter St., N. Y.	*155-161 Leonard St., 5-7 Franklin St., N. Y.*	*381 South St., N. Y.*

FOUNDRY AND PIPE BENDING SHOP
Newark, N. J.

TEMPERATURE AND HUMIDITY CONTROL

JOHNSON
SYSTEM
OF
TEMPERATURE
CONTROL

—

THE
"HUMIDOSTAT"
FOR
CONTROLLING
THE HUMIDITY
OF ROOMS

—

JOHNSON
REDUCING
VALVES
FOR STEAM
AIR, WATER
AND GAS

—

JOHNSON
PRESSURE
GOVERNORS
FOR PUMPS
BOILERS
AND TANKS

—

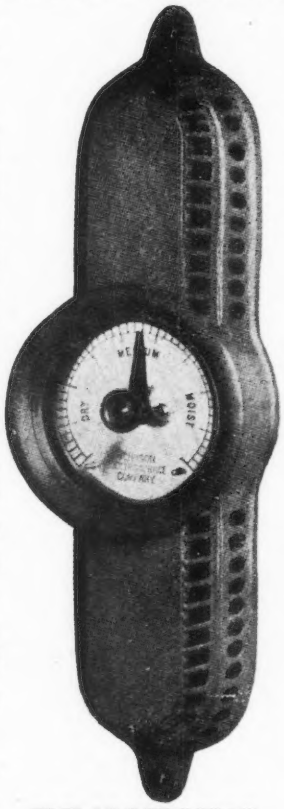
Send for
Catalogue H.

THE HUMIDOSTAT

WHAT IS IT?

The Humidostat is a device which regulates the air moisture in a room and holds it at any desired degree.

It is made of metal, neat in design and equipped with dial and index, which can be adjusted to the amount of Humidity desired. The Humidostat is connected by tubing with the heating apparatus. Its mechanism is so simple that it cannot get out of order, and yet it is so sensitive that it responds to the slightest variation from the desired degree of the moisture in the room.



THE HUMIDOSTAT

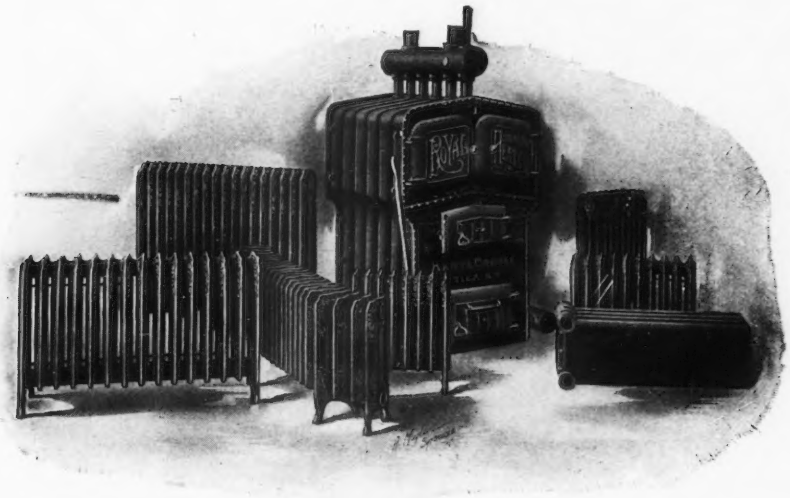
The Humidostat is in use in private residences and public buildings. Also in factories where the process of manufacture requires a fixed air moisture.

The Humidostat is the invention of Prof. Warren S. Johnson, of the Johnson Service Company.

JOHNSON SERVICE COMPANY

MAIN OFFICE AND FACTORY, MILWAUKEE, WIS.

NEW YORK, 36 East 20th Street
PHILADELPHIA, 1522 Sansom Street
PITTSBURG, 440 Sixth Avenue
DETROIT, 41-43 First Street
CHICAGO, 93 Lake Street
BOSTON, 60 Pearl Street
TORONTO, 136 Bay Street
DENVER, 311 Boston Building
INDIANAPOLIS, 22 East Ohio Street
BUFFALO, Erie County Bank Building
SAINT LOUIS, 205 North Tenth Street
MINNEAPOLIS, 203 Second Avenue South
SALT LAKE CITY, 212 S. N. Temple Street



Let us send you a few copies of "Heating and Ventilating the American Home"—an article in booklet form. You can distribute these to advantage among prospective homebuilders in your town.

HART & CROUSE CO.

Home Office: Utica, N. Y.

BRANCHES:
New York, 41st St. and Park Ave. Chicago, 80 Lake St.
Dallas, 659 Elm St. Columbus, Poplar and Henry Sts.
Minneapolis, Exchange. 742 Lumber

If you are not using **SUNRAY HEATERS** and **ROMAN RADIATORS** in your business, why not?

ORDER ONE AND YOU WILL ORDER MORE

Our Fitters' Companion Mailed On Request

The **J. L. Mott Iron Works**

Fifth Avenue and 17th Street, New York

BOSTON CHICAGO DENVER SAN FRANCISCO

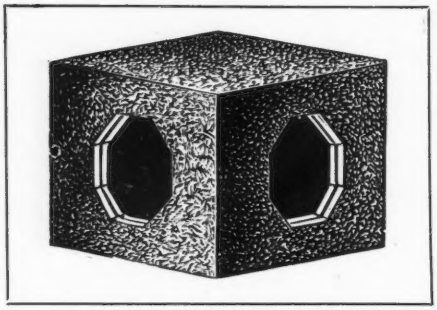
Zinc-Coated Steel Slip Nipples

For Steam and Hot Water Radiators and House Heating Boilers

THE PRATT CHUCK CO., Frankfort, N.Y.

FREE SAMPLES furnished to interested parties

Steam Economy Talks—3



¶ This cut illustrates the manner of covering tees and elbows. The top is put on with screws, so that it can be easily and quickly removed when necessary.

Wyckoff's Water-proof Patent Steam Pipe Covering is made to slip on over the pipes, while they are being connected.

We make the covering in 4-ft. to 8-ft. lengths. The lengths are connected by tenon and socket joints. In putting over the pipes it requires simply to be driven together.

Catalogue F will give you every particular
May we send you a copy?

A. Wyckoff & Son Co.
ELMIRA, N. Y.

Tests made by Prof. R. C. Carpenter of Cornell University show that the transmission of sufficient steam to produce 100 horse power for a distance of 1000 feet in naked steam pipes exposed to still air resulted in a loss through radiation and condensation of 37.6 per cent.

The same pipe covered with wood and solid earth lost 11.2 per cent.

The same pipe inclosed in Wyckoff's Patent Steam Pipe Covering lost *only 4.2 per cent.*

The Heating and Ventilating Magazine

VOL. V No. 6

Contents for June, 1908

Twentieth Annual Convention, National Association of Master Steam and Hot Water Fitters - - - - 1

Data for a Heating Engineer's Handbook - - - *Gerard W. Stanton* 3

IV—Horizontal Tubular Boilers and Their Settings

The Winter of 1907-1908 - - - - - - - 5

Heating and Ventilating Plant at Princeton Theological Seminary - - - - - - - - - - 7

Adapting a Modern System to Old Buildings

Heating Systems for Mills - - - *A. G. Hosmer* 16

The Construction and Ventilation of a Weave Shed - - *Samuel M. Green* 21

Ventilating a House with Cave Air - - - - 28

The Weather for May - - - - - - - - 32

New York, Pittsburg, St. Louis

Trade and Miscellaneous Notes - - - - - ix

YEARLY SUBSCRIPTION, $1.00 SINGLE COPIES, 10 CENTS

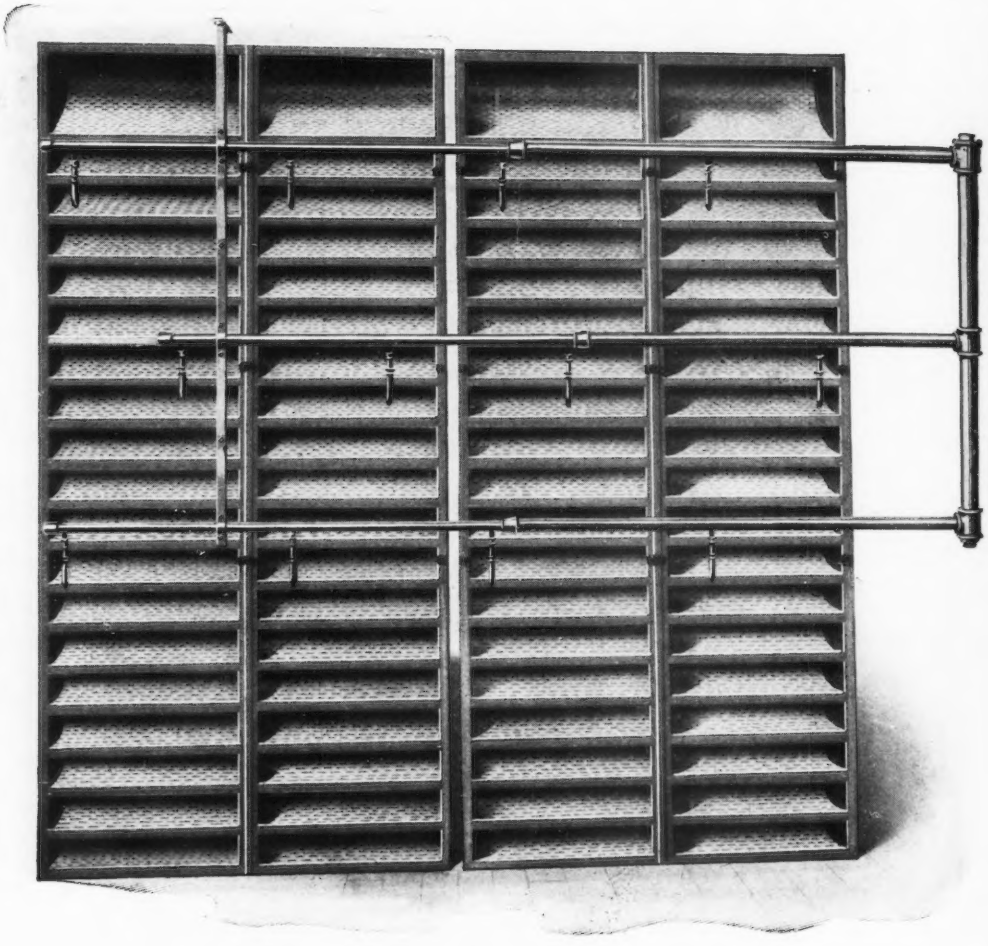
Published monthly by the Heating and Ventilating Magazine Co., 1123 Broadway, New York.

The "Peerless" Air Washer

CLEANS THE AIR
PURIFIES THE AIR
And Gives It the Proper Humidity

• • • •

MADE OF COPPER
IS EVERLASTING
SPRAYS CANNOT CHOKE UP



New Catalogue Now on the Press

The New York Blower Co.

611 Victoria Building, St. Louis, Mo.
639 Bourse Building, Philadelphia, Pa.
253 Broadway, New York, N. Y.

Chicago, Ill.
Bucyrus, Ohio

THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK JUNE, 1908

NATIONAL ASSOCIATION OF MASTER STEAM AND HOT WATER FITTERS

Twentieth Annual Convention, Boston, Mass., June 15-18, 1908

For the second time in its history, the National Association of Master Steam and Hot Water Fitters has made Boston its Convention City and here the craft is gathering in numbers that give every promise of an even more memorable gathering than the well-remembered convention of 1900.

Many faces seen on that occasion will be missed this year, none more so than that of the late Enoch Rutzler, of New York, whose figure was as familiar to the convention goers as that of any other man in the trade. But though death has made its inroads on members and guests alike, it has, on the whole, shown a sparing hand and the bulk of the Old Guard will be present as usual to participate in the Association's deliberations.

The new generation, also, will be on hand in increasing numbers and may be expected to have an important part in the councils of the week.

As was the case last year, the most important question in many ways that will come before the convention is the proposition regarding the use on orders of the rubber stamp, specifying that the order is given with the understanding that all defective parts will be replaced by the dealer and that he will bear the cost both of such parts and of their replacement. This question, it will be remembered, was not adjusted at Washington last year, although the Association passed a resolution recommending that its members use the rubber stamp in placing their orders for steam-fitting materials. The dealers at that time were unwilling to acquiesce in the policy and the subject has ever since that been one that has come up for frequent discussion. A meeting of the Boiler and Radiator Manufacturers' Association is scheduled for Monday of Convention Week, when the Association's proposals will be up for consideration and no doubt, if necessary, other meetings will be arranged in which efforts will be made to arrive at some conclusion that will be mutually satisfactory.

Other important matters that will come up for consideration relate to

the matter of separating specifications and contracts for heating, ventilating and power work from those covering the general construction of public buildings. The Standardization Committee will report, among other things, an important action taken recently by the American Society of Mechanical Engineers in passing resolutions favoring coöperation with the Master Steam Fitters' Association in preparing standards for flanged and threaded connections.

THE ENTERTAINMENT PROGRAMME

An elaborate entertainment programme has been arranged that will while away most delightfully the spare time of the members and guests. The idea of forming an entertainment association made up of the manufacturers and jobbers present, which originated last year in Washington, will again be adopted this year and, as a result, the various outings will be conducted in a systematic manner, so that they will conflict with each other as little as possible. Mr. W. G. Le Compte, of Jenkins Bros., New York, who is chairman of the Manufacturers and Jobbers Entertainment Committee, and also on the entertainment committee of the Eastern Trade Golf Association, made it a point to visit Boston previous to the date of the convention in order to make all necessary preliminary arrangements and thus the wheels are well oiled, as far as the entertainment programme is concerned.

As revised to date, this programme is as follows:

Monday, June 15. Golf match between members of the Eastern Trade Golf Association and members of the National Association of Master Steam and Hot Water Fitters on the links of the Brae Burn Country Club, at West Newton, Mass.

Tuesday, June 16, 9 A. M. Special convention tournament of the Eastern Trade Golf Association at the Brae Burn Country Club, West Newton. Play will continue all day.

Tuesday afternoon, June 16. Automobile ride for ladies in touring cars to Bunker Hill, Charlestown, Chelsea, Lexington, passing Washington's Tree, and visiting Driving Club at Watertown.

Tuesday evening, June 16. Entertainment by the Boston local association at Symphony Hall; music by the Boston Symphony Orchestra. A collation will be served.

Wednesday morning, June 17. (Bunker Hill Day.) Automobile trip, "Seeing Boston," for the ladies.

Wednesday afternoon, June 17. Carriage ride for the ladies through the Boston Park system, stopping at the Brookline Country Club.

Wednesday evening, June 17. Men's bowling match between teams representing the Eastern Trade Golf Association and the Master Steam Fitters' Association. Also ladies' bowling match. Distribution of prizes at the Hotel Brunswick, where a supper will be served.

Thursday, June 18. Steamer trip down Boston harbor to Nantasket Beach, where a shore dinner will be served. A visit will be made to several points of interest along the coast.

Data for a Heating Engineer's Handbook

COMPILED BY GERARD W. STANTON

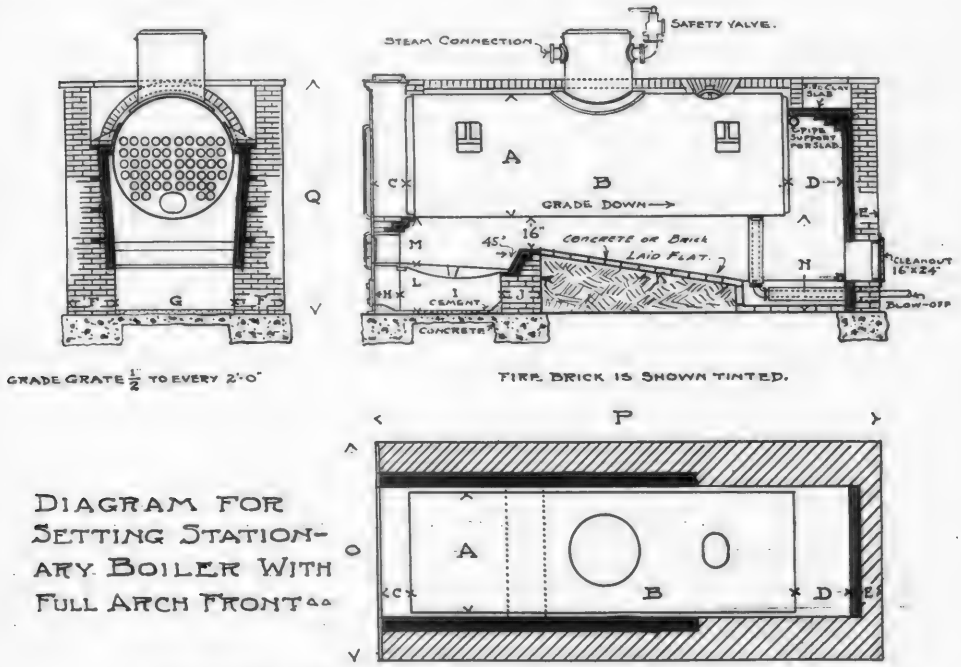
IV.

Horizontal Tubular Boilers and Their Settings

Table 1 gives the general dimensions of standard horizontal tubular boilers built for a working pressure of 100 lbs. per sq. in.; square feet of grate and heating surface; size of feed and blow-off connections and size of safety valve.

Fig. 1 and Table 2 give general dimensions of brick settings for this type of boiler, with the number of brick required. The settings can be modified to suit different conditions, such as having air spaces in the walls; lining the entire combustion chamber with fire-brick instead of only a portion; and having a return flue over the top of the setting.

Nothing original or new is claimed for these tables, they being compiled for convenience in designing and estimating.



HORIZONTAL TUBULAR BOILER SETTINGS—FIG. 1

Editor's Note.—With the publication of the accompanying data concerning horizontal tubular boilers and their settings, Mr. Stanton concludes his present series of charts and tables for a heating engineer's handbook. He will, however, contribute, from time to time, additional tables on various subjects of heating and ventilating work which he has in the course of preparation.

General Dimension of Horizontal Boilers.

Horse Power.	10	12	15	20	20	25	30	35	40	40	45	50	60	60	70	80	90	100	125	150
Dia. of Boiler.	30"	30	36	36	42	42	44	44	44	48	48	54	54	60	60	60	66	66	72	72
Lgth of tubes in ft.	7'	8	8	10	8	10	10	12	14	12	14	12	15	12	14	16	15	16	16	18
No. of 3" Tubes	20	20	28	28	38	38	46	46	46	52	52	64	64	82	82	82	98	98	120	120
" " 3½" "	16	16	22	22	30	30	36	36	36	42	42	50	50	64	64	64	78	78	94	102
Lgth of Grates.	36	36	36	42	36	42	42	48	54	48	54	48	54	48	54	54	54	54	54	60
Sq. ft. Heating Surface.	151	185	220	288	305	376	440	526	591	611	687	708	880	885	1028	1172	1296	1377	1660	
" " Grate "	7½	7½	9	10½	10½	12¼	12¾	14	16½	16	18	18	20½	20	22½	22½	24¾	24¾	27	30
Dia. & Hgth. of Dome	18 3/16	19 2/0	20 2/2	20 2/8	22 2/4	22 2/4	22 2/4	22 2/4	22 2/4	26 2/8	26 2/8	30 3/4	30 3/4	32 3/4	32 3/6	32 3/6	36 4/0	36 4/0	36 4/0	36 4/0
Thickness of shell	¼"	¼	¼	¼	9/32	9/32	9/32	9/32	9/32	5/16	5/16	5/16	11/32	11/32	3/8	3/8	7/16	7/16		
" " Heads.	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	7/16	1/2	1/2
" dome shell	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	9/32	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16	5/16
" " Head	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Wgth Boiler & Casting Full steam gauge	2400	2900	3500	3900	4000	4700	5400	6000	6400	7000	7500	8000	9000	10000	10200	11500	12000	13800	14000	16000	17000	19000	20000	22000	23000
Size Safty V. lever.	1½	1½	2	2	2	2	2½	2½	3	3	3	3	3½	3½	3½	4	4	5	5	6
Size Feed Con.	1¼	1¼	1¼	1¼	1¼	1¼	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	1½	2	2	2
" Blow-off Con.	1½	1½	1½	1½	1½	1½	2	2	2	2	2	2	2	2	2	2	2	2½	2½	2½
Dia of Smoke Stack	14	14	16	16	20	20	22	22	22	24	24	26	26	28	28	28	30	30	34	36
Hgth of " "	28	28	28	35	28	35	35	40	50	40	50	40	50	40	50	60	60	60	60	60

HORIZONTAL TUBULAR BOILER SETTINGS—TABLE 1

d.w.s.

Measurements for Setting Hor. Tubular Boilers—Full Arch Front

Horse Power	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	Brick for one Boiler		Brick for two Boilers Battery	
																		Fire	Red	Fire	Red
10	32"	7"	12"	20"	16"	16"	2'-8"	12"	3'-0"	20"	4'-0"	24	24	3'-11"	5'-4"	11'-0"	7'-8"	200	5500	400	8600
12	34	7	12	20	"	16	2'-10"	"	3'-0"	"	4'-0"	"	24	3'-11"	5'-6"	11'-0"	7'-8"	215	5600	430	8800
15	36	8	12	20	"	16	3'-0"	"	3'-0"	"	5'-0"	"	24	3'-11"	5'-8"	12'-0"	7'-8"	225	6300	450	10000
20	36	10	12	20	"	16	3'-0"	"	3'-6"	"	6'-6"	"	24	3'-11"	5'-8"	14'-0"	7'-8"	250	7200	500	11250
20	42	8	14	20	"	16	3'-6"	"	3'-0"	"	5'-2"	"	24	3'-11"	6'-2"	12'-2"	8'-4"	275	7400	350	11800
25	42	10	14	20	"	16	3'-6"	"	3'-6"	"	6'-8"	"	24	3'-11"	6'-2"	14'-2"	8'-4"	300	9300	600	13000
30	44	10	14	24	"	20	3'-8"	"	3'-6"	"	7'-0"	"	24	3'-11"	6'-4"	14'-6"	8'-4"	275	9500	550	13500
35	44	12	14	24	"	20	3'-8"	"	4'-0"	"	8'-6"	"	24	3'-11"	6'-4"	16'-6"	8'-4"	300	10400	600	14600
40	44	14	14	24	"	20	3'-8"	"	4'-6"	"	10'-0"	"	24	3'-11"	6'-4"	18'-6"	8'-4"	325	11300	650	15800
40	48	12	16	24	"	20	4'-0"	"	4'-0"	"	8'-8"	"	24	3'-11"	7'-4"	16'-8"	8'-8"	350	11500	700	16500
45	48	14	16	24	"	20	4'-0"	"	4'-6"	"	10'-2"	"	24	3'-11"	7'-4"	18'-8"	8'-8"	375	13250	750	18800
50	54	12	16	24	"	20	4'-6"	"	4'-0"	"	8'-8"	"	24	3'-11"	7'-10"	16'-8"	9'-4"	400	12000	800	17500
60	54	15	16	24	"	20	4'-6"	"	4'-6"	"	11'-2"	"	24	3'-11"	7'-10"	19'-8"	9'-4"	425	13800	850	20000
60	60	12	18	24	"	20	5'-0"	"	4'-0"	"	8'-10"	"	24	3'-11"	8'-4"	16'-10"	9'-4"	400	13700	800	21000
70	60	14	18	24	"	20	5'-0"	"	4'-6"	"	10'-4"	"	24	3'-11"	8'-4"	18'-10"	9'-4"	450	15000	900	22900
80	60	16	18	26	"	20	5'-0"	"	4'-6"	"	12'-6"	"	24	3'-11"	8'-4"	21'-0"	9'-4"	450	16300	900	24800
90	66	15	18	28	"	24	5'-6"	"	4'-6"	"	11'-8"	"	27	4'-2"	9'-6"	20'-2"	10'-2"	475	17300	950	26800
100	66	16	18	28	"	24	5'-6"	"	4'-6"	"	12'-8"	"	27	4'-2"	9'-6"	21'-2"	10'-2"	475	18000	950	27000
125	66	18	18	28	"	24	5'-6"	"	5'-0"	"	14'-2"	"	27	4'-2"	9'-6"	23'-2"	10'-2"	525	19500	1050	29000
125	72	16	20	30	"	24	6'-0"	"	4'-6"	"	13'-0"	"	30	4'-5"	10'-0"	21'-6"	10'-8"	500	21200	1000	32000
150	72	18	20	30	"	24	6'-0"	"	5'-0"	"	14'-6"	"	30	4'-5"	10'-0"	23'-6"	10'-8"	550	23000	1100	34500
	78	18	20	30	"	24	6'-6"	"	5'-0"	"	14'-6"	"	30	4'-5"	10'-6"	23'-6"	11'-6"	600	25000	1200	36200
	84	18	20	30	"	24	7'-0"	"	5'-0"	"	14'-6"	26	30	4'-7"	11'-6"	23'-6"	12'-6"	650	26600	1300	39300

HORIZONTAL TUBULAR BOILER SETTINGS—TABLE 2

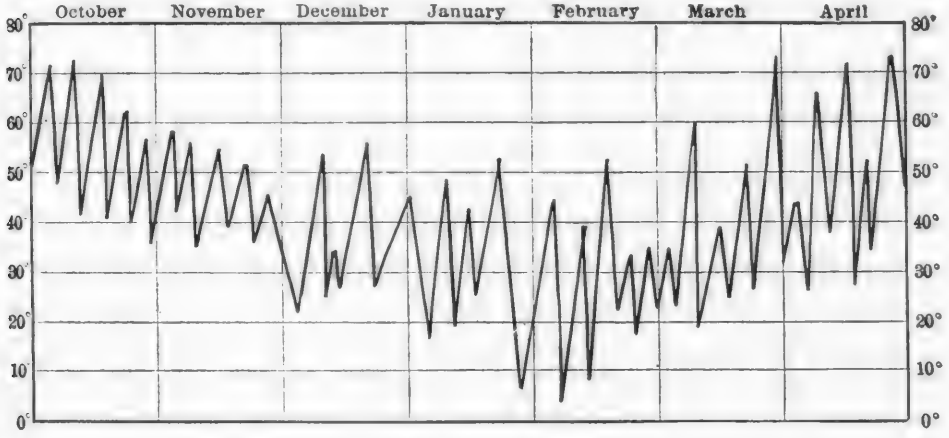
The Winter of 1907-1908

The accompanying charts, showing the temperature variations in five American cities during the heating season of 1907-1908, have been compiled from the monthly charts which have been published in THE HEATING AND VENTILATING MAGAZINE during the past winter, detailing, in plotted form, the weather conditions in the same cities.

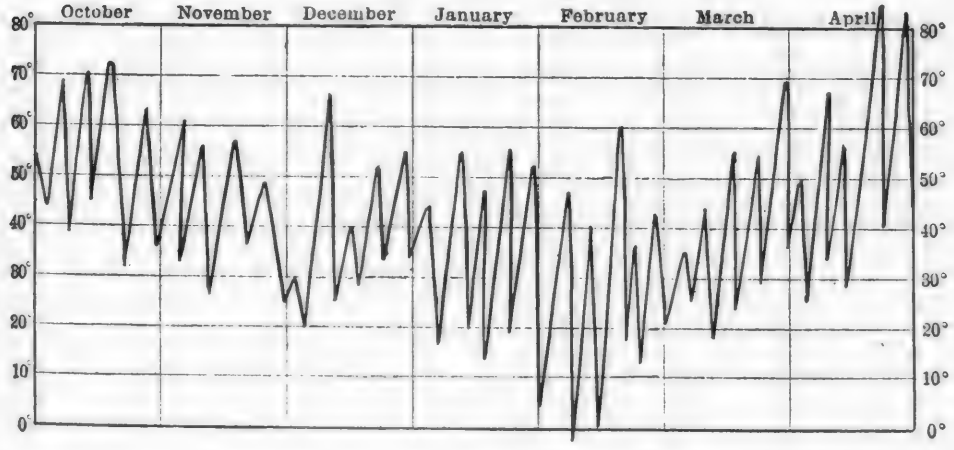
The winter of 1907-1908 was more typical, on the whole, than that of 1906-1907. There were fewer abnormal periods and the conditions existing most of the time may be taken as those that would ordinarily be met with.

The information regarding the temperature is here condensed for purposes of convenient reference. As explained last year, when we published similar charts covering the winter of 1906-1907, the charts do not give a continuous record of the temperatures, as this would be impracticable, but the peaks represent the extent of the fluctuations during different periods of the month and also, approximately, the times at which such high and low temperatures occurred.

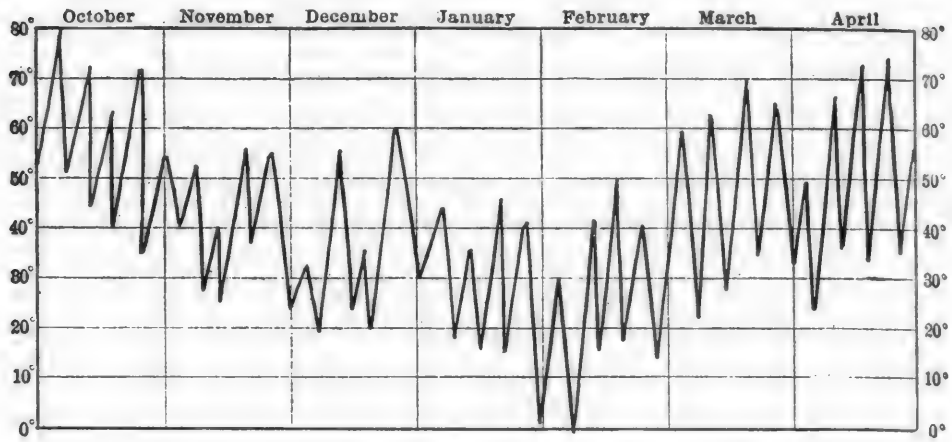
It is a noteworthy fact that the official observer in each city, all the records being those of the United States



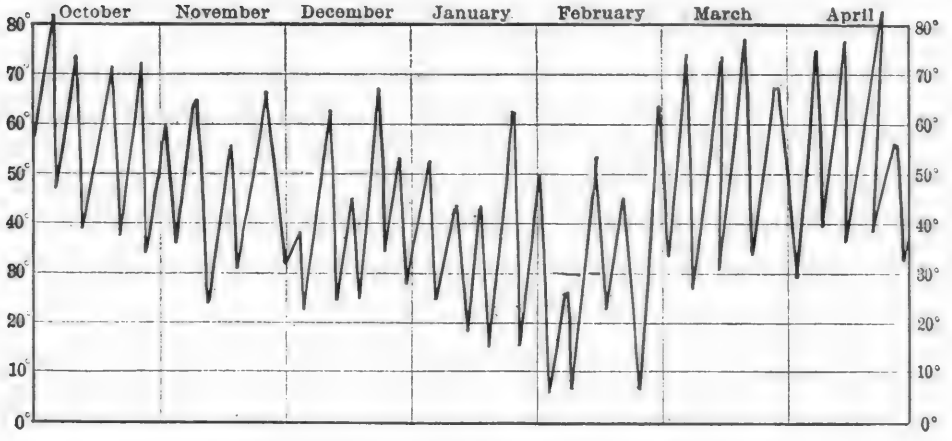
TEMPERATURE VARIATIONS IN NEW YORK, 1907-1908



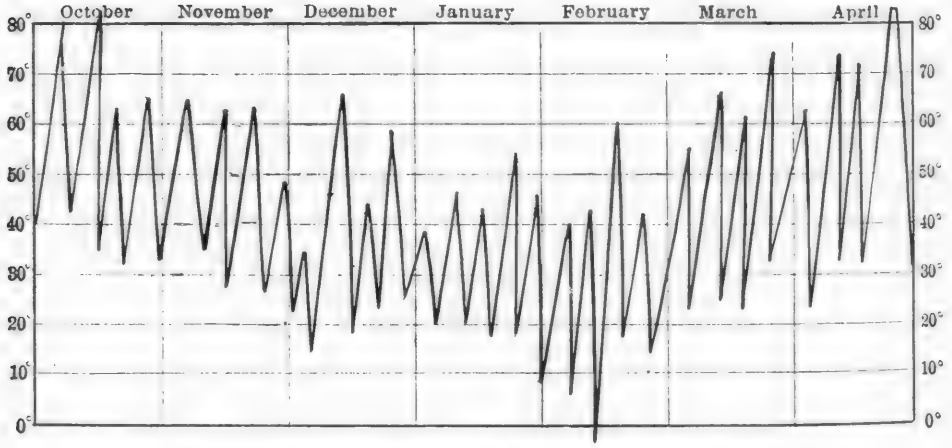
TEMPERATURE VARIATIONS IN BOSTON, 1907-1908



TEMPERATURE VARIATIONS IN CHICAGO, 1907-1908



TEMPERATURE VARIATIONS IN ST. LOUIS, 1907-1908



TEMPERATURE VARIATIONS IN PITTSBURG, 1907-1908

Weather Bureau, recorded but four instances of zero temperature, all of these occurring in the latter part of January and early part of February. This gives added emphasis to the conditions disclosed by last year's records, namely, the rarity of zero temperatures in the localities indicated, the comparatively high average of the temperatures prevailing during the daytime of most days and the general similarity of the temperature conditions, at least, in all five cities.

Heating and Power Plant at Princeton Theological Seminary

Adapting a Modern System to Old Buildings

To provide a heating and ventilating plant for a group of buildings already constructed, some of which are very old, involves problems and difficulties not ordinarily encountered in equipping a similar group of buildings during the course of their construction.

In the case of the plant under consideration three of the buildings have been heated by stoves and three by hot-air furnaces; three buildings (Alexander Hall, Hodge Hall and Brown Hall), which have been heated by stoves have been lighted by oil lamps.

The plan proposed was to install a central heating and lighting plant which should provide heat and light for all of these buildings and this involved the piping and wiring of the entire group.

It was possible to locate a central plant at a point where all the water of condensation would return to the power house by gravity and therefore a simple system of two-pipe steam heating was determined upon. All of the buildings except Stuart Hall and Miller Chapel are heated entirely by direct radiation, these two buildings being provided with a combination system of direct and indirect radiation and a ventilating system in which use is made of steel plate exhaust fans.

The lighting system is a 220-volt, two-wire, direct current system.

The power house is built of brick, the exterior being of gray face brick with limestone trimmings, granite ground course and slate roof. The walls of the engine room are lined with white enameled brick and the walls of the boiler room are red brick.

The coal pocket is constructed entirely of concrete, the roof and grad-

ELEVATION OF POWER HOUSE, PRINCETON THEOLOGICAL SEMINARY

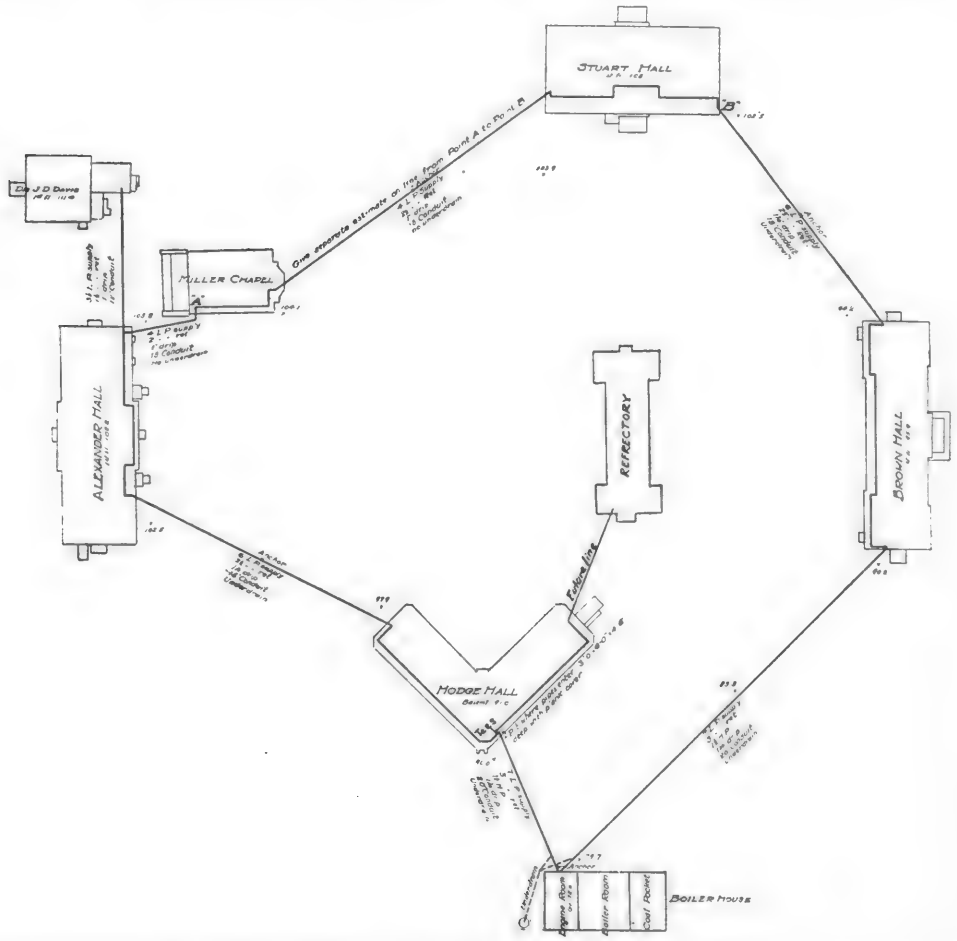
ing being arranged so that teams can be driven directly thereon, the coal being dumped through coal holes without handling.

The chimney, with interior diameter at top of 42 in. and 100 ft. high, is built of radial brick, the exterior course being gray to match the building walls.

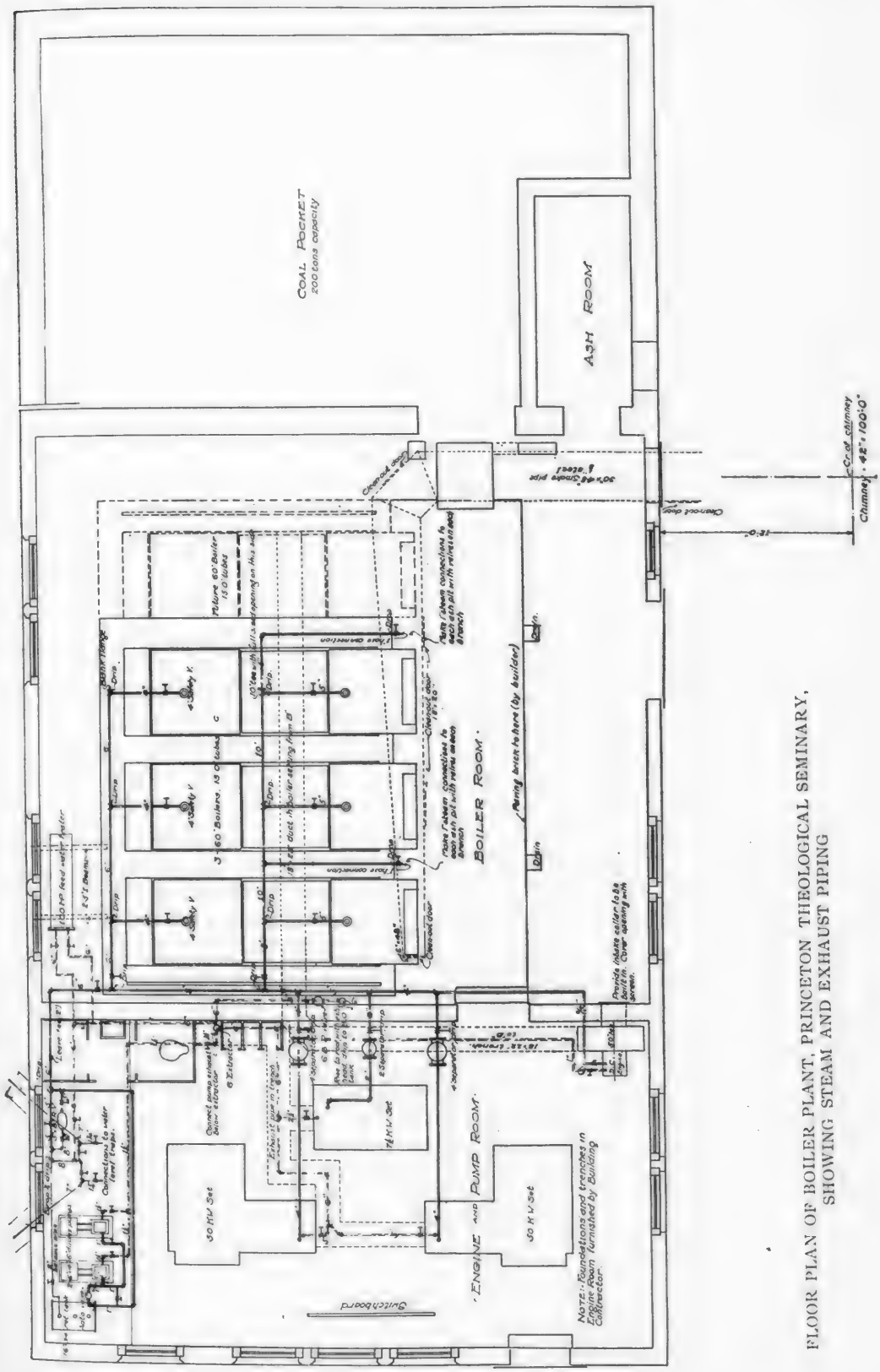
Toilet conveniences and lockers are provided in the engine room for the operating force.

The boiler plant consists of three horizontal tubular boilers 60 in. in diameter, 16 ft. 4 in. long, built of 3/8-in. open-hearth fire-box steel, with heads 1/2 in. thick of open-hearth flange steel, triple-riveted horizontal seams, seventy-four 3 in. tubes, 15 ft. long, manhole in top of shell and in front head below tubes. The boilers are set in the usual masonry, with shaking grates.

In the bridge wall is built an air duct, through which air is forced under the grates by a 50-in. steel plate fan, driven by a direct-connected engine, of the American Blower Company's make. The operation of this engine is controlled by a Foster balanced valve operated by a Locke damper regulator in such a way as to combine with the chimney draft in providing a balanced draft system for the boilers. The draft of each boiler may be controlled by hand, if desired, by means of a damper over the air inlet under the grates, which is op-



GROUND PLAN, PRINCETON THEOLOGICAL SEMINARY, SHOWING STEAM PIPE LINES TO VARIOUS BUILDINGS


COAL POCKET
200 tons capacity
A.S.H. ROOM
BOILER ROOM.
ENGINE AND PUMP ROOM.
Future 60" Boiler 150 tubes
3-60" Boilers 13 Q tubes
Piping brick to here (by Builder)
Provide brick cellar to be built in. Door opening with
Connections to water heater etc.
Switchboard
30 H.V. Set
12 H.V. Set
Note:: Foundations and trenches in Engine Room furnished by Building Contractor.
Chimney 42'-0" 100'-0"

FLOOR PLAN OF BOILER PLANT, PRINCETON THEOLOGICAL SEMINARY,
SHOWING STEAM AND EXHAUST PIPING

erated by means of a rod extending through the boiler front.

The auxiliaries include two 6 in. x 4 in. x 6 in. Worthington Duplex brass-fitted boiler feed pumps with the usual receiving tank, the operation of the pumps being controlled automatically by means of a float in the tank and a Waters balanced valve. All feed water in passing to the boiler passes through a 100 H. P. horizontal type Davis-Berryman feed-water heater. A Fairbanks "M. & T." scale, with extension lever, is provided for weighing the coal as burned.

The electric plant consists of two 12 in. x 12 in. simple horizontal Ridgway engines, direct connected to 50 K. W. direct current 220-volt Ridgway generators and one 7 in. x 7 in. similar engine connected to a 7½ K. W. generator of the same type.

The operation of the electrical plant is controlled from a conveniently located switchboard of blue Vermont marble, equipped with a full outfit of instruments and switches.

The boilers are piped by a simple method into a 10-in. working drum through 5-in. outlets from the boiler nozzles, there being a balancing or auxiliary drum 6 in. in diameter to which each boiler is connected through 4-in. pipe. This auxiliary drum is cross connected into the main piping system for emergency use.

Steam passes directly to the three engines from the main header and the exhaust pipe runs in the trench, as shown, to the point where it rises and thence passes through a 6-in. direct separator with back pressure valve above, just below which the connection is taken to the steam lines running to the buildings in the underground conduits. A second connection from the drum passes into the engine room and is connected to the heating system steam lines through a 5 in. x 8 in. Monash regulating valve.

A slight change from the plans has been made in installing this plant. The water level traps shown on the plans have been omitted in the power house and a similar trap has been placed in each building, connected to the main return pipe thereof.

The return pipes in coming into the boiler house connect directly to the receiving tank, from which water is pumped through brass piping through the feed-water heater to the boiler.

STEAM HEATING SYSTEM

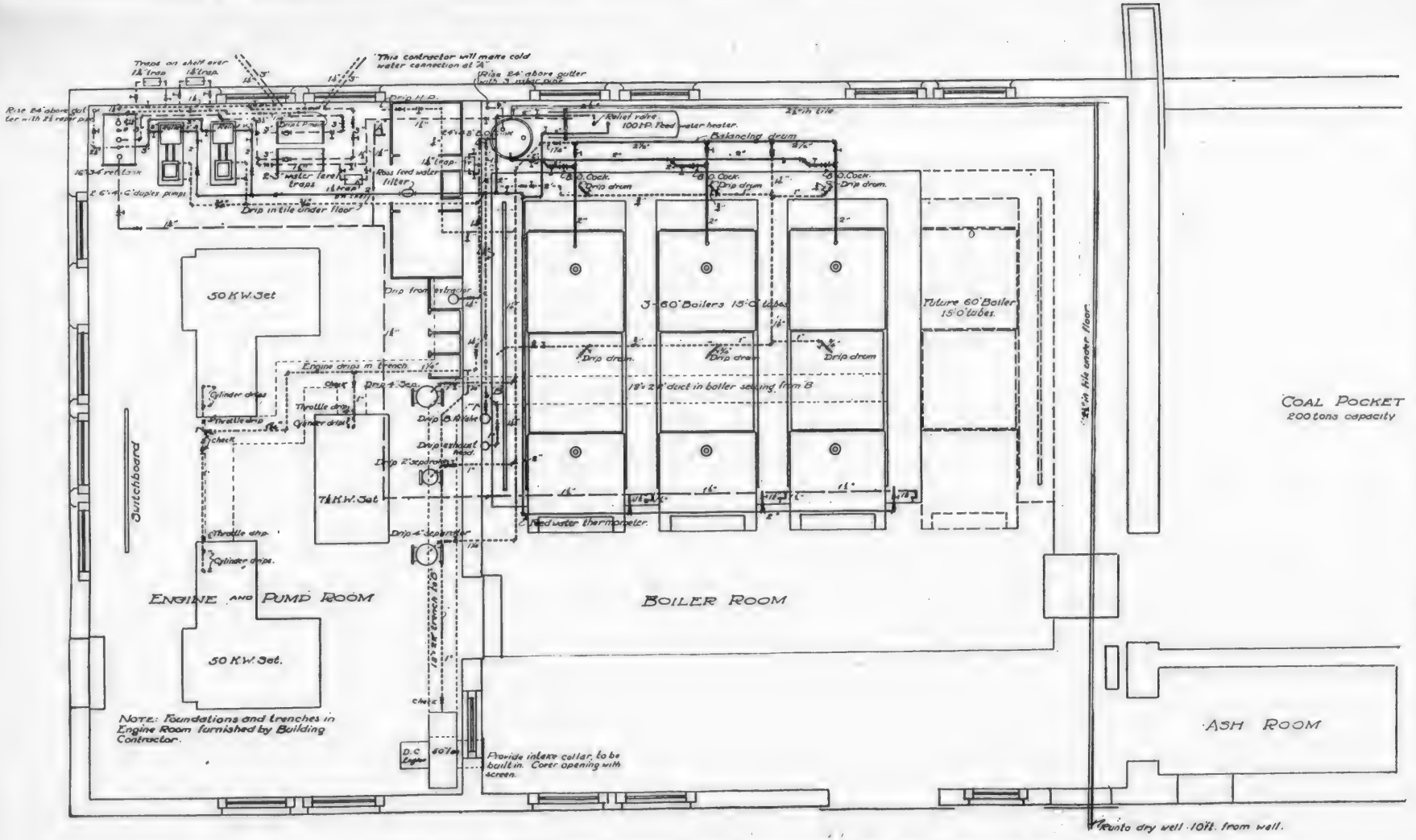
From the power house two lines run to the buildings, one being 7-in. low-pressure supply-pipe with 3-in. return pipe running to Brown Hall, the other being pipes of the same size running to Hodge Hall. The line between Stuart Hall and Miller Chapel is installed so that, as will be noted, there is a complete circuit of steam lines, making it possible to reach every building in either direction, thus providing against interruption of service under any conditions.

Only wrought-iron pipe is used in this underground work. The underground pipes are laid in "J.-M." sectional conduit.

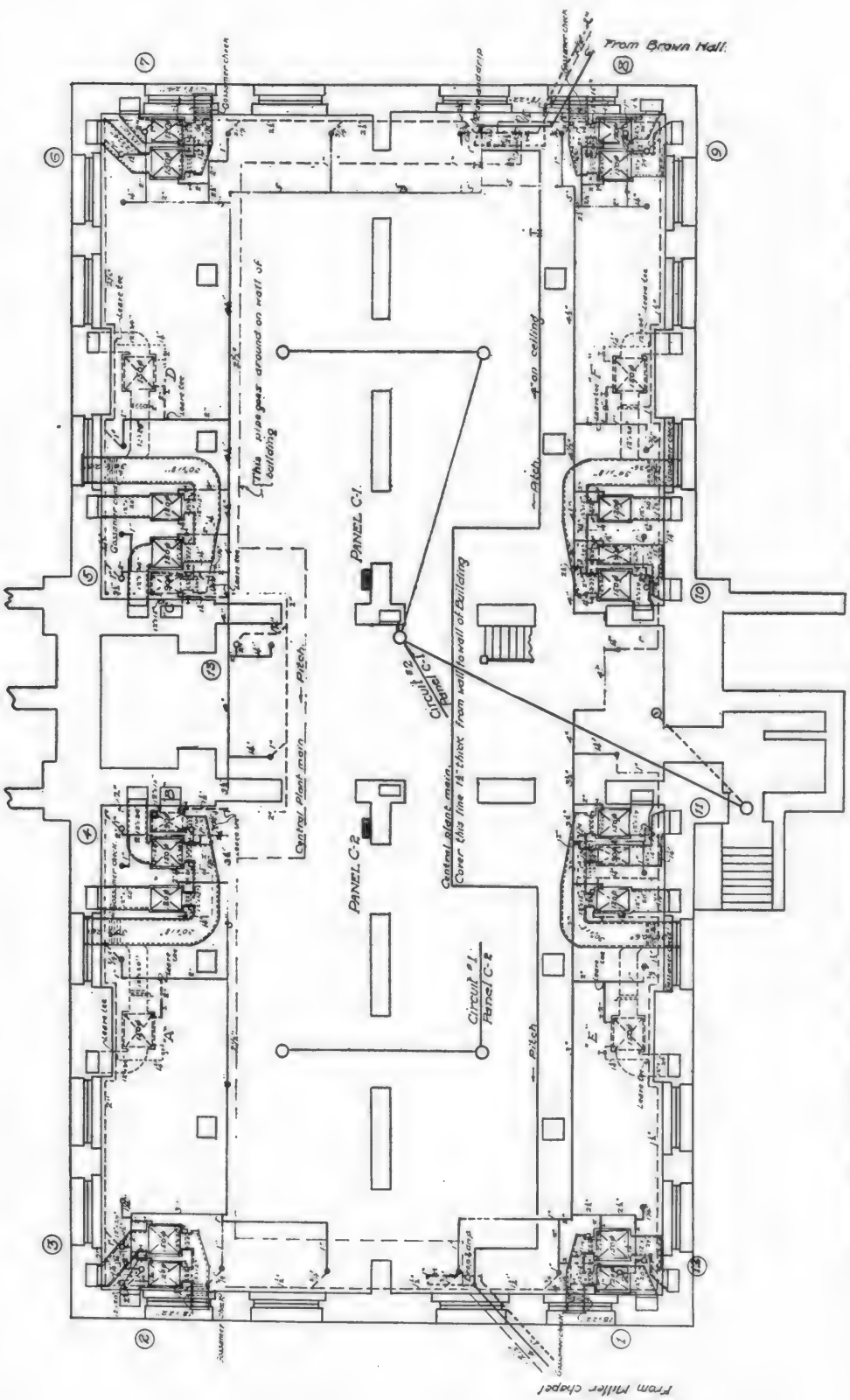
The supporting "T's" with roll frames and rolls are placed on 18 ft. centers, thus providing for the support of the pipes entirely independent of the conduit. The pipes are thoroughly insulated with "J. M." insulating material of asbestos fiber and sponge, the sizes of the conduits being determined in such a way as to provide for a minimum of 3 in. of insulation. This system provides for the installation of underground mains at the lowest cost consistent with the highest efficiency.

At the side of the steam conduits are located the tile conduits in which are laid the lead-encased electric cables, except that the lines of electric cables from Alexander Hall to the Library Buildings are laid without tile conduits, the lead-encased cables being served with double steel tapes and jute, being thus buried in the ground without additional protection.

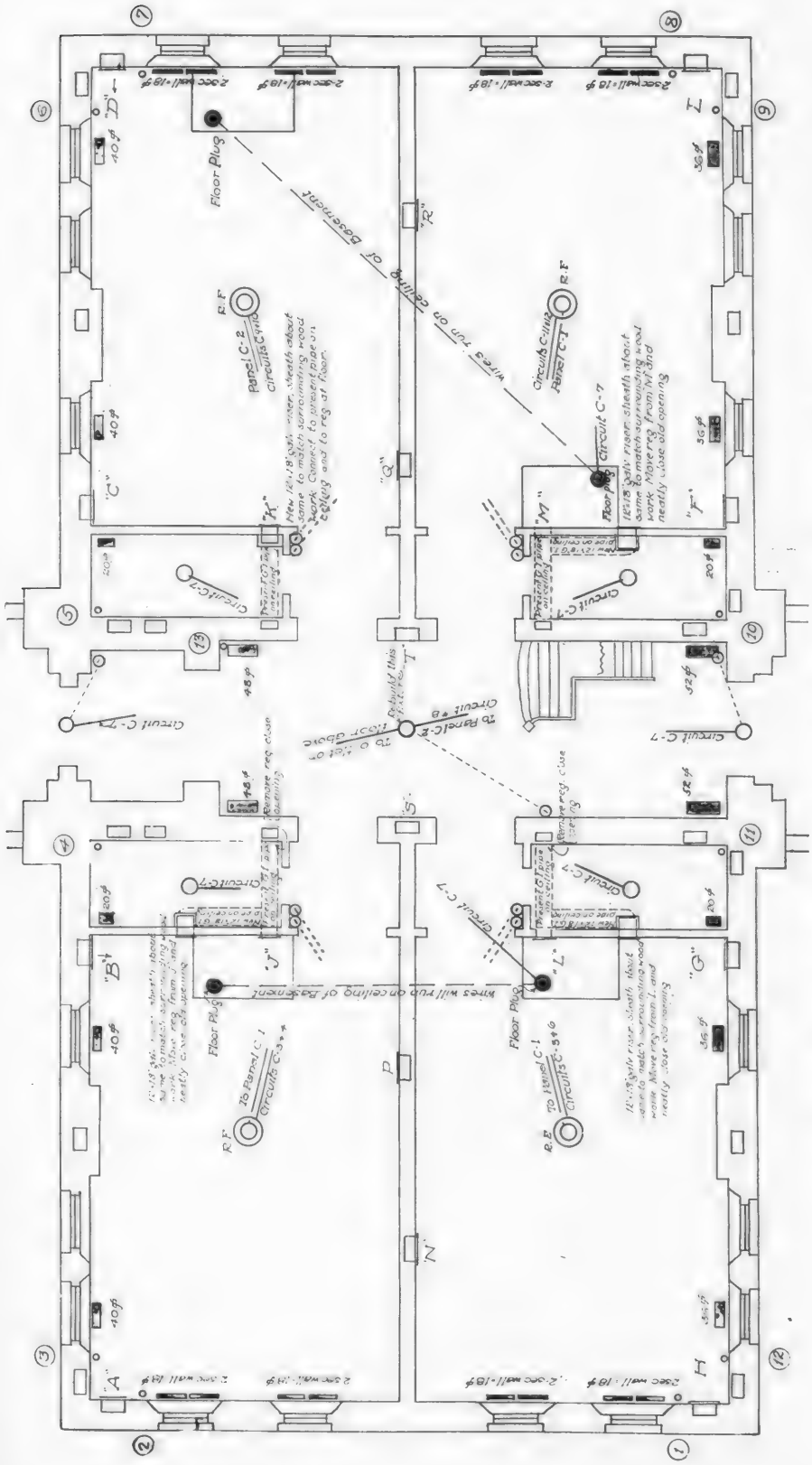
The pipes in the power house and the central plant mains in the buildings are covered with Asbesto-Sponge sectional covering, while the steam and return piping in the six build-

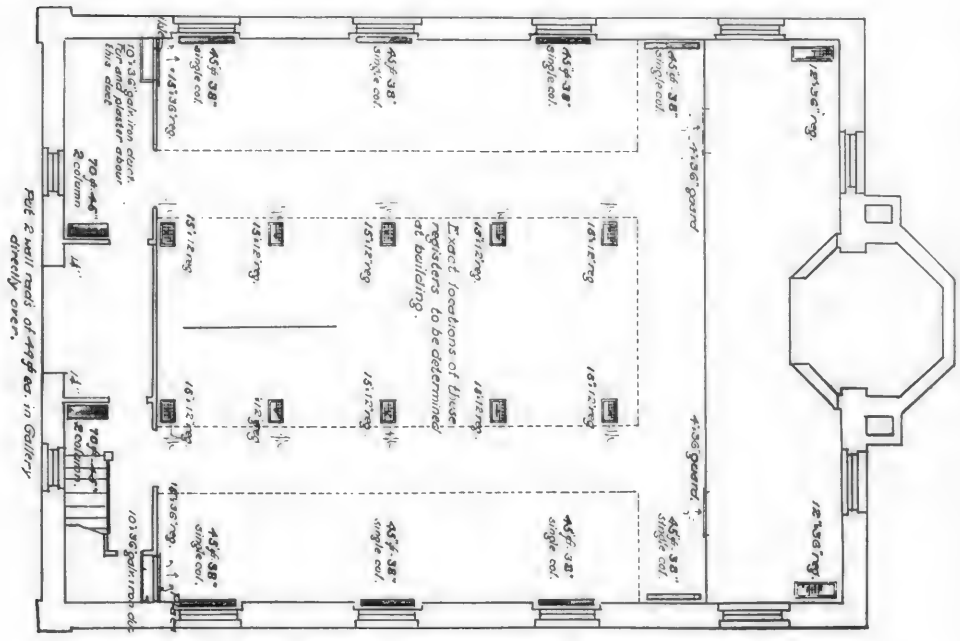

50 K.W. Set
3-60" Boilers 15'-0" tubes.
Future 60" Boiler 15'-0" tubes.
COAL POCKET
200 tons capacity
Switchboard
75 K.W. Set
ENGINE AND PUMP ROOM
BOILER ROOM
50 K.W. Set.
ASH ROOM
Balancing drum
Relief valve
100 H.P. Feed water heater.
Feed water thermometer.
Ross feed water filter
Drip in tile under floor
Engine drips in trench
Provide inlets collar, to be built in. Cover opening with screen.
Drip to dry well 10ft. from wall.
NOTE: Foundations and trenches in Engine Room furnished by Building Contractor.

FLOOR PLAN OF BOILER PLANT, PRINCETON THEOLOGICAL SEMINARY, SHOWING RETURN AND DRIP PIPING

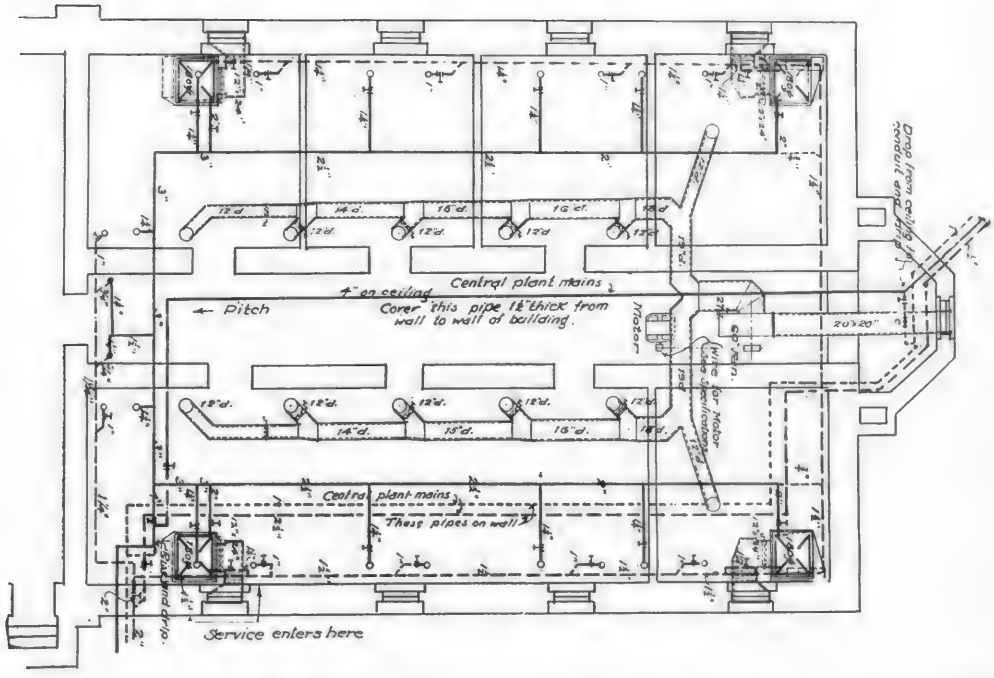


BASEMENT PLAN OF STUART HALL, PRINCETON THEOLOGICAL SEMINARY, SHOWING INDIRECT STEAM HEATING SYSTEM

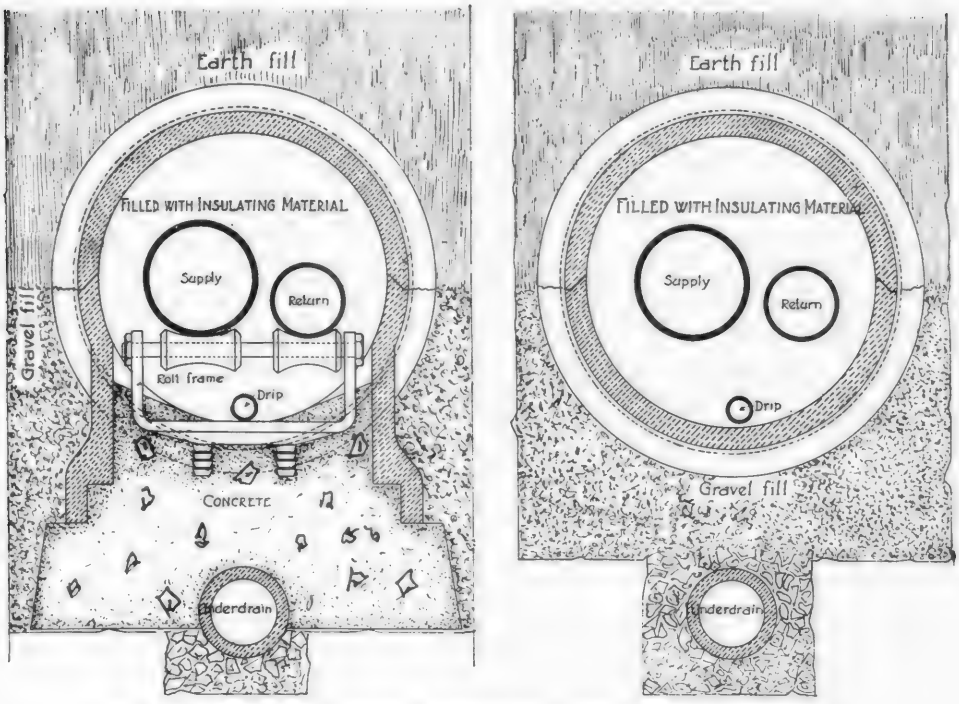

Floor Plug
Ceiling of basement
Wires run on
Panel C-2
Circuits C-3
Panel C-1
Circuits C-3
Circuit C-7
Panel C-7
Circuit C-7
Panel C-8
Circuit #8
To Panel C-8
Circuit C-7
Panel C-1
Circuits C-3
Circuit C-7
Floor Plug
Wires run on ceiling of basement
Floor Plug
Circuit C-7
Circuit C-7
Circuit C-7



FIRST FLOOR PLAN, MILLER CHAPEL, PRINCETON THEOLOGICAL SEMINARY


Central plant mains
4" on ceiling
Pitch
Cover this pipe 18" thick from wall to wall of building.
Central plant mains
These pipes on wall
Service enters here

BASEMENT PLAN, MILLER CHAPEL, SHOWING USE OF HOT AIR FURNACE PIPES IN INDIRECT STEAM HEATING SYSTEM



SECTION THROUGH CONDUIT, PRINCETON THEOLOGICAL SEMINARY

ings are covered with Asbestocel sectional covering. All flanges are covered and also the tops of the boilers, smoke pipe, up-takes and overhang of boilers.

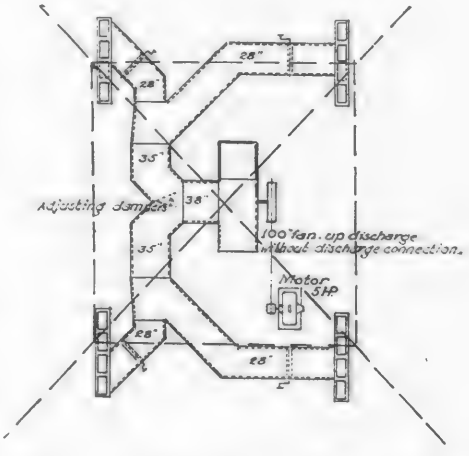
The piping of the buildings is of the simplest order, all except Miller Chapel and Stuart Hall being entirely direct radiation. In Miller Chapel and Stuart Hall, the latter being a recitation building, indirect radiation is used to provide a supply of fresh air to the rooms. In the latter building use was made of the old furnace flues to convey air to the rooms, they being unusually large in size. The building had been built with a fairly satisfactory system of vent flues, except that they were somewhat small. By means of a 100-in. steel plate blower placed in the attic the velocity through these flues is increased sufficiently to provide reasonably satisfactory ventilation for this building.

To the main return of each building is attached a water-seal trap for the purpose of making possible the individual control of the water line of each building.

A 4½-in. steam gauge, graduated to 15 lbs., is attached to the steam main in each building.

The Kinnear steel pressed radiators are being used for the direct radiation throughout.

In the three dormitories a ¼-in. steel tank with steam coil is provided for giving a supply of hot water to the building.



PART PLAN OF ATTIC, STUART HALL, SHOWING VENT DUCT WORK AND FAN

The amount of radiation in these buildings is as follows:

Building	Square ft. Direct Radiation	Square ft. Indirect Radiation
Miller Chapel	598	720
Brown Hall	3,187	
Stuart Hall	2,057	2,340
Dr. Davis's House	818	
Hodge Hall	3,312	
Alexander Hall	3,260	
	13,242	3,060

The design of the entire plant, including the power house is by Richard D. Kimball Co., New York and Boston. The power house was built by Wm. R. Matthews, of Princeton, N. J.; the boilers by D. M. Dillon Steam Boiler Works, Fitchburg, Mass.; the engines and generators by Ridgway Dynamo and Engine Co., Ridgway, Pa.; and the electric wiring by J. H. Lehman, Princeton, N. J. The system of underground conduits and pipe covering is supplied and installed by H. W. Johns-Manville Company, New York; and the entire system of steam piping is installed by John L. Reid, Newark, N. J.

*Heating Systems for Mills**

By A. G. Hosmer

There are in general use in manufacturing buildings three distinct types of heating systems: First, the direct, where the heat is supplied by means of pipes containing steam installed in the rooms; second, the indirect or blower system, by introducing air previously heated; and, third, the hot water or forced circulation system, where the water heated in an outside heater is forced through pipes arranged much the same as those for steam, and returned to be reheated again, thereby making a continuous circuit.

It is the writer's purpose to enumerate some of the merits and demerits of the several systems and consider their adaptability under the varying conditions met with in mills and factories.

Before taking up the subject, however, it is well, perhaps, to mention the fact that, while the theory is true that air will absorb heat from any source, provided the supply is warmer than itself, in order that a cold room may be warmed to a comfortable degree and kept so in heating weather, it is necessary that the temperature of the heat supply shall be much higher than the desired temperature in the room, unless the area of heating surfaces of volume of heated air (in case of an indirect system) is much larger than it is advisable to provide in the average building for use only half the year.

The Direct System

We will first consider a plant using non-condensing engines and heating with exhaust steam wholly or partially during running hours, and direct steam for the remainder. It is a common custom to place a light back pressure on the engines to force the exhaust through the pipes at the proper velocity to absorb all the available heat contained therein and discharge the resultant condensation at the end of the lines at quite a low temperature.

If the areas of the pipes are ample and they are not too long or complicated, this method works well, but it is often not the condition; the steam is condensed before it reaches the end of its journey, rendering it almost useless as a source of heat for a considerable part of the way. In this case we must either raise the back pressure or turn in direct steam to accomplish the desired end.

It should be borne in mind that the adding of 1 lb. of back pressure to an engine cannot be made up by adding 1 lb. to the initial pressure, as back pressure is the same as mean effective pressure resisting through the whole stroke, while initial pressure extends

*An address delivered before the National Association of Cotton Manufacturers.

its full force only to the point of cut-off.

It is quite clear that adding back pressure to an engine, especially if it is large and well loaded, should be avoided if possible. From the foregoing statements it would seem that the entire heat from exhaust steam cannot usually be utilized without running more or less back pressure on the engines, and therefore cannot be forced or hurried to any extent unless disagreeable conditions are brought about in the engine room. In some instances the circulation of the exhaust is assisted by establishing a vacuum at the discharge end of system by means of a pump or fan, thus doing away with the objectionable back pressure on the engines. This is a decided advantage if the engines are large, but it necessitates the complication of piping, with the cost and running expense of some more or less elaborate system for the maintenance of the vacuum. As a rule, the method of heating by exhaust steam leaves a great deal to be desired, and is not advisable unless it is necessary to use non-condensing engines.

Taking low pressure steam from the receiver of a compound engine is a common practice in some mills. If the quantity of steam taken is fairly constant and the engine is designed with that object in view, the results are quite satisfactory, although this idea is usually more popular with the designing than with the operating engineer.

CONDITIONS TO BE CONSIDERED

It is well to remember when designing any supply of heat for the purpose of warming buildings of a manufacturing plant that exhaust or receiver steam is available only during running hours, and that the heating system's highest duty is usually required when the engines are shut down; consequently, it is more important to have an efficient service durng non-running hours than at times when machinery friction and other causes contribute to the warmth of the workrooms.

With a direct system installed and designed for the use of live or boiler steam alone, the engines are left out of the proposition, and direct steam, usually reduced in pressure, is sent to the heating pipes, remaining there until condensed and finally discharged through a trap to the atmosphere, or to a tank, to be fed back to the boilers.

With the trap working properly, nearly the same pressure is kept upon the entire length of pipes and all water automatically removed. This renders every foot of pipe equally efficient, with the heat nearly uniform and due to the pressure carried.

In a building or series of buildings closely grouped, and with it possible to have the drips carried to some point somewhat lower than any of the heating pipes and not too far from the boilers, the condensation ought never to be cooler than 200°, and can be pumped or trapped to them without much loss of heat.

If piping is large and well installed, with separate traps for each considerable unit of circulation, the direct system will be found to be one of the most economical and satisfactory methods of heating. It can be forced or moderated within reasonable limits by raising or lowering the pressure at reducing valve, and with everything right will give return for practically all the heat expended.

The benefit of returning the condensation to the boilers is quite often not realized in many plants fitted for so doing, for the reason that a pump designed and used for handling very hot water is one of the most difficult appliances to keep in repair that the mechanic has to deal with; consequently, the tendency generally is to neglect this important feature, and, as the heating can be done without it, that is, by running the water to waste, the pump is allowed to stand idle for a great part of the time. This should not be permitted, as the expense of keeping it in first-class order is a small item compared with the loss of the heated condensation.

In buildings equipped with either the direct or hot water system where no wall space is required for storage or other purposes the pipes can be

placed around the sides below the windows. As warm air naturally rises, this location ensures good heat distribution and comfort for the operatives.

The prevailing custom at the present time is, however, to arrange them on the ceilings, where they will not be injured by passing trucks or obscured by material stored in front of them.

With the overhead location the coils are not as liable to become repositories for brooms, clothing, waste or other refuse which might ignite and cause serious damage by fire.

The Indirect or Blower System

The efficiency of any steam heating system depends on the amount of steam condensed or relieved of its heat per square foot of surface exposed.

It is therefore clear that pipes of a given area arranged as in the fan system, where cool air passes through them very rapidly, are many times more efficient than a radiating surface of the same area exposed under ordinary conditions.

The fresh air for use in this system is usually supplied from out of doors, and in heating weather is always cool enough to absorb heat from almost any source of even moderate temperature. Warm water from condensers circulated through pipes, furnace gases passing through large flues on their way from economizers to chimney (when artificial draft is employed), together with live and exhaust steam, can be used successfully. Direct steam heating coils are usually located so that condensation can be returned to the boilers. Heaters using exhaust steam should be so arranged that the cool air passes through or over them in the opposite direction to the current of steam and enters at the cool or discharge end.

It is customary to arrange the fan to draw the air through the coils and force it to the various rooms.

As any blower can usually give more efficient results when placed near the air supply, it would seem preferable to install it at the inlet and handle the air before it is heated.

It is important that the openings from air trunks into the rooms should be of moderate size and well distributed, and that the size and capacity of the fan and heaters should be such that the required volume of supply can be furnished at a moderate velocity without causing too much of a current. In many cases this system has not given satisfaction from the failure to give attention to the above points.

Rooms in exposed locations or on the north side of a building always require more heat than those more fortunately situated. These can be accommodated without making any change in the heating plant proper by placing auxiliary coils in the main ducts leading to the points where extra service is required.

REHEATING THE AIR

It is often possible to obtain very economical results with this system by using the air more than once, or taking warm air from one department where there may be a surplus of heat, from the nature of the work, to a cooler department. This necessitates a return duct or by-pass back to the suction side of fan, and is not feasible unless the rooms and heating plant are quite near together.

The advantages of this system are many, and for some kinds of manufacturing, particularly where a moderate heat and plenty of fresh air is needed, is perhaps the best in use. It is quite simple, and the parts requiring care are compact, with no heating pipes located where freezing is possible or where leakage can do much damage. Results can be obtained very quickly, and in many cases the warm air need not be turned into the rooms until within a few minutes before starting time. In some parts of textile manufacture this constant changing over of the air is not desirable, having a tendency to make the rooms too dry, and, unless the incoming air is moistened by some means before entering, conditions are too much dependent on the weather. In rooms filled with revolving shafting and pulleys the current set up by the fan should not be as strong as in those without machinery.

The Hot Water or Forced Circulation System

In order to obtain satisfactory results with this system, speed of water through the circulating pipes must be high, to prevent any too sluggish movement in the shunts or isolated coils that offer a little more frictional resistance than the more direct lines, and also the temperature should not be allowed to fall very much during its passage through the entire system, to secure uniform efficiency throughout. In ordinarily cool weather it should be sent out as warm as 200° and returned at not less than 150°.

In some plants this system has been installed with a view of utilizing the heat of the exhaust steam from condensing engines on its way to the condenser, by placing a heater between and running the engines with a vacuum more or less reduced.

As has been mentioned, the temperature of the outgoing water should be about 200° and that entering the heater 150°. It is evident that to enable the water to absorb any heat from the exhaust the vacuum would have to be adjusted to make the temperature of said exhaust somewhat above 150° or at least 160°; this corresponds to a vacuum of about 20 in., or 5 lbs. absolute pressure.

At a temperature of 180° we have only 12 in., and at 200° 6 in., or a little less than one-fourth of the usual efficiency of the condenser. The choice is offered, then, to either run a low vacuum and sacrifice a portion of the benefit derived from the condenser or add live steam in a secondary heater to make up for what the low pressure steam cannot do. For efficient results with this method of heating the water while passing through the exhaust chamber, the size of engines and capacity or requirements of the circulating system should be so proportioned that the passing water will absorb the entire amount of available heat in the exhaust steam.

A CASE IN POINT

To illustrate, we will suppose we are running the engines with a vacuum of 12 in. to give the exhaust a temperature of about 180°. Our circulating water enters the heater at 150°; thus we have 30° available.

If the quantity of water exposed in the heater is sufficient to absorb all the heat passing in the exhaust (that is, heat above 150°), all is well; but, as the temperature of this heating medium is governed wholly by the condition of the vacuum, regardless of the quantity of exhaust going by, any excess will pass through without giving up its available heat, and the impaired vacuum will have to be made up by steam from the boilers for a part of which there will be no return. In other words, we will have to add enough extra heat in form of boiler steam to raise the mean effective pressure to the point it would be with regular conditions in condenser, and to pay for this we have only what heat has been absorbed by the circulating water.

Every 2.04 in. taken from the vacuum decreases the mean effective pressure 1 lb. It will be remembered that back pressure or vacuum, as the condition on the discharge side of an engine may be called, applies to the entire length of stroke, the same as mean effective pressure. It is therefore evident that the raising or lowering of this pressure, even a few pounds, on a large engine cylinder, means quite a serious difference in the important work done by the condenser and the power output of the engine.

WHEN THE EXHAUST STEAM IS INSUFFICIENT

If the quantity of exhaust steam is insufficient at times, care must be taken to avoid lowering the vacuum too much, as it will spoil regulation and complicate things generally, especially with compound engines. The line between waste and economy in this proposition is so finely drawn that to use the minimum temperature of the exhaust with also the minimum amount of direct steam, and realize the best conditions, the adjustments should be watched very closely. In installations where the engines and condenser systems are not considered and direct steam used entirely the

heaters are usually placed in the boiler house, enough above the water line of boilers to ensure a gravity return for the condensation. Provision must of course be made for operating the circulating pump at night and during holidays and Sundays.

In nearly all equipments of this kind a supplementary heater or section of one of the heaters is used for the exhaust from the pump engine or turbine.

As has been spoken of before, the most severe duty on the system comes when the plant is shut down, particularly early mornings. At such times the water must be used at the maximum temperature, and, as the exhaust from engine is not over 210°, unless back pressure is made use of, the steam will pass by the water coils, transferring little or no heat to them. In places where condensing water is available it is sometimes better to install a small condenser for the pump engine and do away with the inefficient exhaust heater.

The circulating system is sometimes connected with the economizers to use the waste heat passing to chimney during non-running hours. While the theory of this is excellent, in practice it is hardly ever desirable, for the reason that the economizers during working hours are handling water quite hot, and at a high pressure, and if cooler water at a much lower pressure is introduced it contracts the joints and produces a change in conditions which usually develops more or less serious leaks, and perhaps the loss of a gasket when the high pressure leaks, and perhaps the loss of a gasket when the high pressure is again admitted. The repairing of economizer joints is not a pleasant task, to say nothing of the trouble and expense of having the machine out of commission when needed.

This system cannot be hurried to any extent, and it is consequently advisable to avoid letting a building cool down very much during cold weather by running the circulation continually.

In this respect a direct heating system using steam has a material advantage, as it is seldom needed until a few hours before starting time, and rarely through the entire day.

In case of accidents to the machinery driving the pump a bad feature presents itself, as it is necessary to use steam in the circulating pipes instead of water. This is almost sure to cause trouble if the pockets or drops in the lines are not properly drained, for the entrapped condensation will cause hammering, with innumerable leaks, and frequently splits some large fitting.

Particular attention should be always given to installations of this kind to arrange the pipes with the same pitch and draining facilities that would be required if high pressure steam was used.

The excessive number and size of pipes required in this system is quite a detriment in plants where space on walls or ceilings is limited and lighting capacity not the best.

ADVANTAGES OF THIS SYSTEM WHEN BUILDINGS ARE SCATTERED

For a plant consisting of many buildings scattered, and at some distance from the boilers, the hot water system is admirably adapted. If the heaters are large and well installed, where little or no heat can be lost by radiation, with direct steam condensation returned to boilers at little or no expense, and with a pump operated economically, nearly all the heat taken from the boilers can be made good use of, and a service provided unattainable by any other means.

The first cost of the different systems varies greatly and depends somewhat upon local conditions, but usually the steam equipment is much cheaper than either blower or hot water system.

In many plants of considerable size and devoted to many different processes it usually occurs that in some department or buildings one particular type is better adapted and will give much better results than any other; it seems sensible, therefore, in considering heating facilities for such a plant, to abandon the idea of employing one system alone.

The Construction and Ventilation of a Weave Shed*

By Samuel M. Green

In the fall of 1904 the Farr Alpaca Company, of Holyoke, Mass., commissioned the writer to build a weave shed for them, and specifically stated that they wished the difficulties experienced with the weave shed they were then operating eliminated as far as possible in the new design.

The first weave shed, with saw-tooth skylight, for this company, was erected in 1874. This shed had a rather low roof, and constant difficulty was experienced with leakage and condensation. It has also proved very difficult to properly ventilate.

I will not go into a discussion of the reasons for the use of what is known as the saw-tooth construction of skylights for weave sheds, because every one familiar with this class of building knows it to be the only practical way of properly lighting such a building. The advantages of the saw-tooth form of skylight over the ordinary hipped skylight are north light and elimination of the direct rays of the sun.

Practically all of the troubles of the saw-tooth method of skylight construction are caused by severe winter weather conditions, and can be classed under two heads, *i. e.*, leakage caused by severe snow, ice or sleet storms, and inside condensation caused by low outside temperature.

When snow and ice accumulate on a saw-tooth roof they melt near the peak of the roof and run down toward the gutter. As the water runs into the

*An address delivered before the National Association of Cotton Manufacturers.

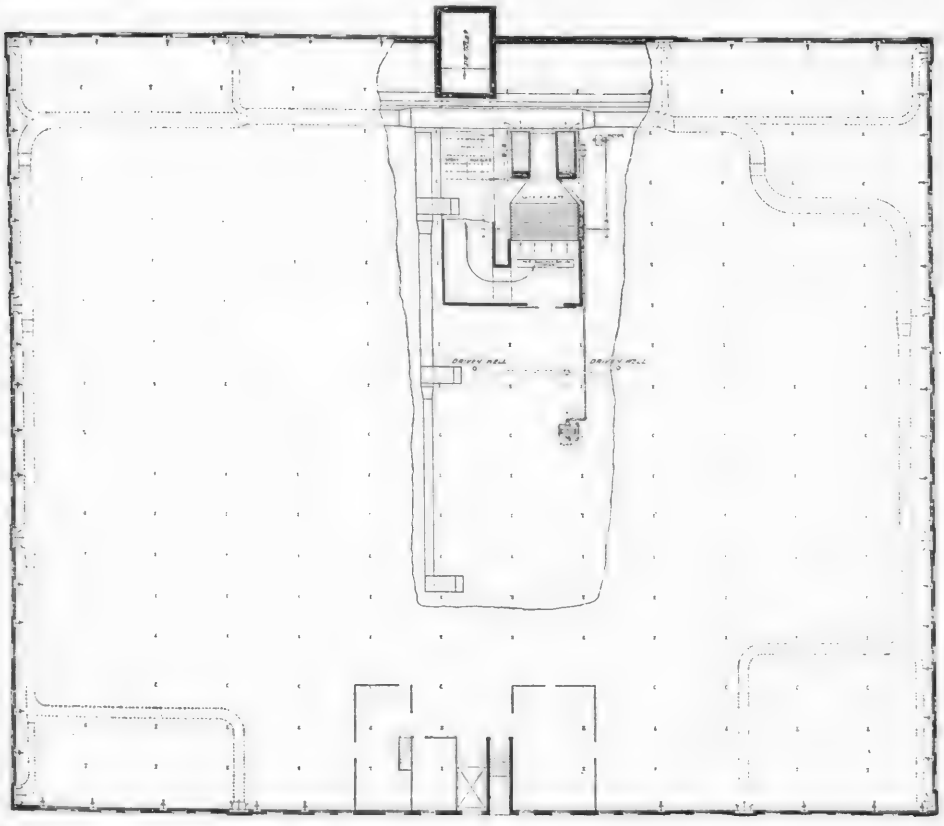


FIG. 1.—VENTILATING, COOLING AND HUMIDIFYING SYSTEM IN WEAVE SHED OF FARR ALPACA COMPANY

shadow caused by the peak of the next saw-tooth it will freeze on the lower portion of the roof and in the gutters.

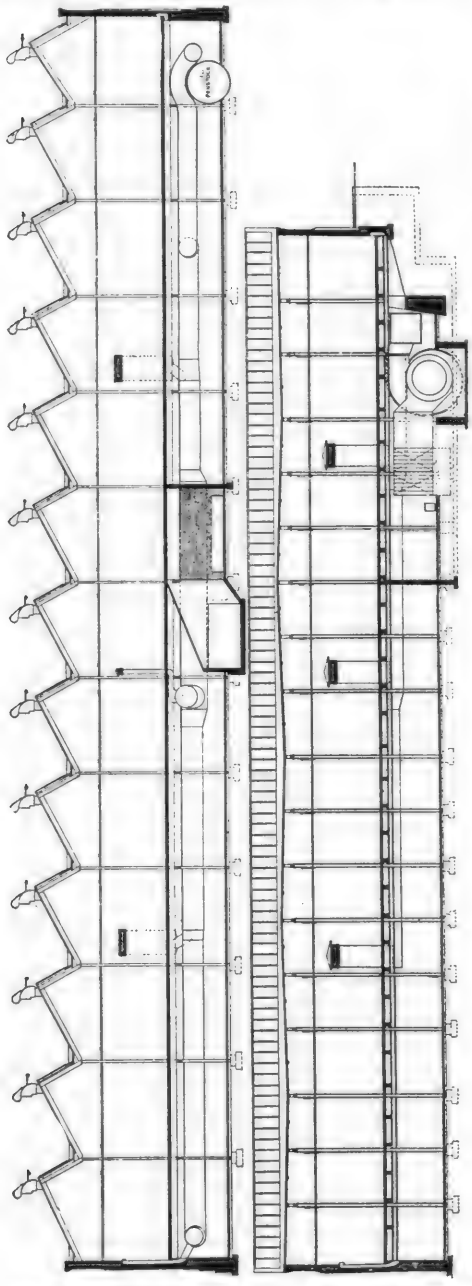


FIG. 2—LONGITUDINAL AND CROSS SECTIONS OF WEAVE SHED OF FARR ALPACA CO., SHOWING VENTILATING, COOLING AND HUMIDIFYING SYSTEM

This alternate freezing and thawing causes the water to back up under flashings, and it is therefore necessary to make them absolutely tight.

A detail of gutter, glass, stile and ridge construction was adopted for this weave shed, in which the toe of the truss is supported by an I-beam column and the gutter is supported by light cross beams. These beams are set at different heights in the length of the gutter, so that proper pitch is obtained from the high point of the gutter to the point where the water it taken down.

The curb or bottom part of the skylight sash is of 4-in. Michigan pine, beveled at a sharp angle at its top to permit the water of condensation to readily run off the curb, and it is also grooved at the lower part of this bevel to form a drip edge, so that all condensation on the glass will drip into a small copper gutter which is carried the whole length of this sill. This copper gutter is connected by means of small lead pipes to the regular roof downtakes.

VENTILATING AND HEATING

After a thorough investigation of the methods in vogue in various weave

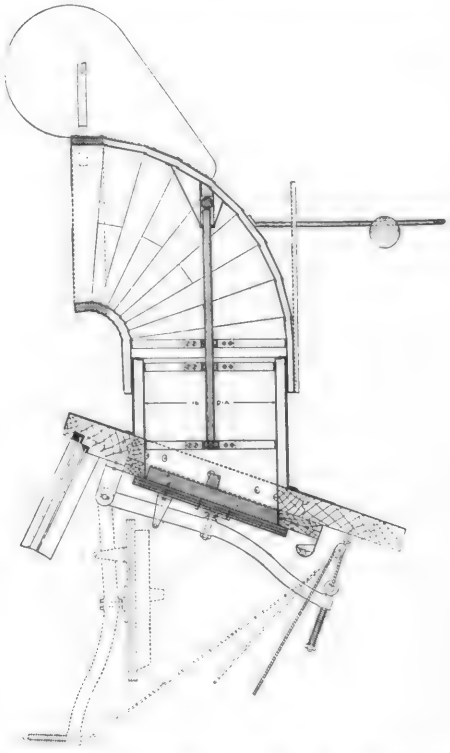


FIG. 3—ROOF VENTILATOR FOR SAW-TOOTH ROOF

sheds throughout the country it was decided to heat this shed by direct radiation, and to accomplish this result steam pipes were placed around the walls of the building, near the floor, and also run lengthwise of the building, underneath the skylights. One-third of the amount of pipe in this building is at the roof, and two-thirds near the floor line.

The direct system of radiation was adopted because of the fact that it is more economical to operate.

For the ventilating, cooling and humidifying, fans were placed in the basement. There are two steel plate blowers having wheels 90 in. in diameter and 48-in. face. These are arranged so that they can either draw air from outside, from the basement, or from both sources. These fans are each driven by a 25 horse power motor, and they run at 150 revolutions per minute. The builders' rating for each of these fans, at this speed, is about 48,000 cu. ft. of air per minute. Each of the fans, when running at its rated speed, requires 20 horse power to operate it.

The air is drawn from outside or from the basement, or from both sources at the same time, as shown by Figs. 1 and 2.

For cooling and humidifying the air in the summer there is a system of spray nozzles placed in the conduit through which the air from outside passes to the fans.

These spray nozzles are of special design and deliver the water in an exceedingly fine spray into the air current. There are 48 of these nozzles, and they require 30 gal. of water per min., under about 40 lb. pressure. The water to supply them is pumped from the ground by a triplex power pump requiring about 3½ horse power to operate it. The temperature of the water from these wells always remains at 54° F. After the air passes through this fine spray of water it encounters baffle plates which remove the entrained water, and the air then passes on to the fans, and is carried by galvanized iron piping to various sections of the basement, and from these passes up into the weave room above through pipes in the walls, and is delivered into the weave room at about 8 ft. above the floor. Deflectors have been arranged on these outlets so that the air can be guided in the proper direction, as it was found that if this current of air strikes the weavers they feel chilly. It is therefore guided just over their heads.

On each saw-tooth there are provided four 16-in. ventilators. Roof ventilators have been a constant source of annoyance, owing to the fact that they condense the moisture from the outgoing air, which drips into the room below. To obviate this difficulty these ventilators were specially designed. (Fig. 3.) The walls of both the stationary and revolving parts are made double and the space between is filled with non-conducting material. In order to tightly close the ventilators, to prevent condensation in winter, a damper was designed, shown in Fig. 3. This damper shuts against soft packing, and has proved satisfactory. A slight amount of condensation, however, has occurred, even with this tight-closing damper, and this is cared for by a metal trough, into which this condensation drips. It alternately collects in this trough and then re-evaporates.

HUMIDIFYING ARRANGEMENTS

Both fans are operated at their maximum capacity during the summer. For humidifying and ventilating in winter one fan is operated, drawing part of its aid from the basement and part from out of doors. The air is humidified by passing over an iron trough in which water is boiled. The steam arising from this boiling water accomplishes the proper humidification.

There are a large number of openings from the weave room into the basement, at the floor line. These openings are protected by automatic dampers, so that in case of fire they will automatically close. These openings are utilized in winter for circulating the air from the weave room into the basement.

It has been found that this method of ventilating, cooling and humidify-

TABLE OF TESTS SHOWING THE DEGREES OF TEMPERATURE AND HUMIDITY IN "B" WEAVE SHED OF FARR ALPACA COMPANY, HOLYOKE, MASS., JULY, 1907.

(Results obtained by using 48 spray nozzles, using 30 gallons of water per minute at 40 pounds pressure. Temperature of water, 54 degrees Fahr.)

NOTE: The upper numbers in columns three and five show conditions in "A" shed.

		Temp. of Air in Duct.			Temp. of Air Entering Room.			Temp. of Air Center of Room.			Outside Temp. in Shade.			Humidity in Room.		
		10 A.M.	2 P.M.	5 P.M.	10 A.M.	2 P.M.	5 P.M.	10 A.M.	2 P.M.	5 P.M.	10 A.M.	2 P.M.	5 P.M.	10 A.M.	2 P.M.	5 P.M.
								80	91	95				60	40	44
July 1	Rain	64	66	68	69	71	72	80	83	84	76	87	86	65	63	63
" 2	"	65	67	67	68	71	71	83	86	88				61	50	54
								78	81	82	70	82	78	67	68	60
" 3	Cloudy	50	60	60	66	67	67	81	83	85				50	50	52
								78	80	80	74	76	76	60	57	60
								78	90	93				54	42	53
" 5	Fair	62	62	62	68	68	68	78	82	82	74	86	78	62	60	54
								80						56		
" 6	"	63	. .	. .	70	. .	. .	80	. .	. .	76	. .	. .	62	. .	. .
								83	93	95				64	42	42
" 8	"	66	64	66	70	70	71	81	84	84	78	88	84	65	59	60
								86	92	92				52	54	54
" 9	"	64	63	60	71	71	68	84	84	82	81	85	80	50	57	55
								80	79	77				46	60	64
" 11	Rain	61	61	61	66	66	66	76	76	75	67	67	63	66	67	68
								75	81	83				60	50	52
" 12	Showers	61	65	62	66	68	68	73	76	78	67	72	74	73	73	68
								80						54		
" 13	Fair	60	. .	. .	66	. .	. .	78	. .	. .	72	. .	. .	61	. .	. .
								82	89	92				56	48	50
" 15	"	62	64	65	68	72	72	79	82	83	71	84	80	63	61	61
								81	88	92				61	58	57
July 16	Fair.	66	68	69	71	74	74	78	82	84	76	83	82	69	68	67
								86	95	94				69	60	57
" 17	"	72	75	70	76	70	76	82	87	86	83	90	82	72	60	60
								87	97	99				66	52	48
" 18	"	70	72	72	76	77	77	84	88	88	85	93	88	67	65	63
								87	96	97				52	40	58
" 19	"	65	66	66	73	74	74	83	86	86	80	92	86	60	54	55
								86						58		
" 20	Cloudy	67	. .	. .	72	. .	. .	86	. .	. .	76	. .	. .	67	. .	. .
								82	92	89				58	44	52
" 22	"	64	64	66	72	72	72	81	84	82	78	86	77	63	57	63
								82	92	92				62	48	48
" 23	"	66	66	65	72	74	74	81	84	84	78	85	82	66	62	62
								81	87	91				62	52	52
" 24	"	62	66	67	70	72	74	78	81	83	73	81	81	60	64	64
								85	94	97				64	48	48
" 25	"	69	68	70	75	77	74	82	86	86	80	90	87	67	62	59
								85	93	90				64	54	56
" 26	Showers	69	71	68	74	76	74	82	86	84	78	88	81	70	67	66
								70						44		
" 27	Fair	55	. .	. .	65	. .	. .	78	. .	. .	68	. .	. .	53	. .	. .
								80	93	94				50	42	42
" 29	"	63	65	64	70	72	71	81	83	84	76	88	80	63	58	60
								83	91	94				50	42	42
" 30	"	64	64	64	70	72	72	80	83	84	76	86	82	65	58	59
								84	92	93				51	40	39
" 31	"	62	62	63	69	70	70	81	84	84	77	84	83	59	50	55

ing has been exceedingly satisfactory. There are no parts of the room that are not thoroughly ventilated, and there are no "dead" spaces where condensation can occur. The air is kept perfectly sweet and clean, and the conditions, as far as humidity is concerned, are good. The cooling has been very successful, as appears from the table attached hereto. The temperatures in this weave shed have been kept much lower than the temperatures in the old "A" weave shed, and on hot days have kept as low as, or lower than, the temperature of the outside air.

It is believed that this cooling tends to better work and to attract a higher class of operatives. The whole system has been so satisfactory that the Farr Alpaca Company have decided to completely rebuild their old "A" weave shed along these lines.

The consequence arising from inefficient or inadequate heating service in a textile mill, even for a few hours at a time, are too well known to need any comment other than to emphasize the importance, in any system, of having heaters, pipes, and, in fact, everything connected therewith, of ample size and capacity.

American Foundrymen's Association

Among the papers read at the annual convention of the American Foundrymen's Association, in Toronto, Canada, June 8-12, were the following: "Preventions of Accidents in the Foundry," Thos. D. West, Sharpsville, Pa.; "Annealing Castings," W. M. Carr, New York; "Foundry Warehouse Methods," F. C. Everitt, Trenton, N. J.; "Pattern-making for the Specialty Shop," H. M. Lane, Cleveland, O.; "Core Sands and Mixtures," A. M. Loudon, Elmira, N. Y.; "Shop Management," H. F. J. Porter, New York; "Foundry Waste," Harrington Emerson, New York; "Ferroalloys in the Foundry," W. M. Saunders, Providence, R. I.; "Cupola Thermics," S. H. Stupakoff, Pittsburg, Pa.; "Specifications for Castings to Be Machined," H. E. Diller, Chicago, Ill.; "Foundry Transportation Methods," David Goehr, Cleveland, O.; "Coke Making in the United States," Dr. R. Moldenke, Watchung, N. J.; "Further Notes on Sandless Castings," V. B. Lamb, New Haven, Conn.; "Titanium in Cast Iron," Dr. R. Moldenke, Watchung, N. J.

Papers are also expected on the development of thermit in the foundry, on valve making, and on oxy-acetylene welding of castings, etc.

Discussions are scheduled on "Turnings and Borings in the Cupola," "Clamping Molds," "Radiator Cores," "Sea Coal Facings," and on the proposed change in foundry pig iron specifications.

The Federal Furnace League

A new organization of hot-air furnace manufacturers was effected at the Hotel Astor, New York, May 11 last, having for its object the promotion of the furnace system of heating to the level, at least, of other systems of hot air heating. An address read by the chairman of the meeting, Charles S. Prizer, vice-president of the Abram Cox Stove Company, took up the merits of the warm air furnace and emphasized the necessity of an educational campaign among architects and heating engineers, as well as among furnace dealers. Following Mr. Prizer's address, the subject was discussed by a number of furnace manufacturers, all favoring the proposition. A resolution was presented by Joseph F. Kernan, to the effect that a national organization of furnace manufacturers be formed under the title of the Federal Furnace League. The resolution was adopted unanimously and a nominating committee was appointed, consisting of Joseph F. Kernan, Fred E. Lee and D. S. Richardson. The committee presented the following ticket which was elected: President, Charles S. Prizer; vice-president, Fred E. Lee; treasurer, F. H. Moore; secretary, Wilson Ferguson; executive committee, D. S. Richardson, Joseph F. Kernan, F. H. Moore, Fred E. Lee and Charles S. Prizer. The executive committee was given power to appoint two additional members.

It was voted to refer to the executive committee the matter of an advertising campaign. F. H. Moore offered a resolution providing for the compiling of a furnace book for architects and one for furnace men.

Among those present at the meeting were: E. W. Peck, Coöperative Foundry Company; F. W. Moore, International Heater Company; Fred E. Lee and John A. Howard, Estate of P. D. Beckwith; D. S. Richardson, Richardson & Boynton Company; Edward Benedict, Thatcher Furnace Company; William Seymour, Graff Furnace Company; L. V. Sandford, Kelsey Heating Company; Joseph F. Kernan, Syracuse Stove Works; L. J. Jacobs, Isaac A. Sheppard & Co.; W. T. Andrews and J. Warren, Stamford Foundry Company; T. D. Buckwalter, Buckwalter Stove Company; Charles S. Prizer and H. J. Fueller, Abram Cox Stove Company; J. P. Barstow, Barstow Stove Company; John R. McKnight, Mt. Penn Stove Works; John Edwards, Union Stove Works; Walter P. Warren, Fuller & Warren Company.

Franklin Institute, Philadelphia

Recent papers read before the Franklin Institute, Philadelphia, are "Practical Experiments in Steel," by Charles L. Huston, of the Lukens Iron and Steel Co., Coatsville, Pa., Feb. 13, and "Casting Pipes in Permanent Moulds," by Edgar A. Custer, March 26.

American Society for Testing Materials

The eleventh annual meeting of this society will be held at the Hotel Traymore, Atlantic City, June 23-27 next. This society now has a membership of over 1,000.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

SPECIAL HOTEL RATES FOR NIAGARA FALLS MEETING

Secretary W. M. Mackay has sent out notices to the members, advising them that a special rate of $3 per day and upward, on the American plan, may be had during the meeting of the society, at the Cataract and International hotels, Niagara Falls, July 24 and 25, 1908. Invitations for guests (who will have the privileges of the meeting) will be sent out later.

THE HEATING AND VENTILATING MAGAZINE

Vol. 5 June, 1908 No. 6

PUBLISHED MONTHLY AT
1123 BROADWAY, NEW YORK
BY THE
HEATING AND VENTILATING MAGAZINE CO.
Secretary and Treasurer, A. S. ARMAGNAC
The address of the officers is the address of this magazine.

A. S. ARMAGNAC, EDITOR

European Representative:
AMERICAN PUBLICATION BUREAU, 31, Overton Road, Leicester, England

Subscription, - - - - - $1.00 per year
Foreign countries, - - - - 1.50 " "
Back numbers, - - - - - 15 cents a copy

Manuscripts submitted for publication must in every case be accompanied by postage; otherwise they will not be returned.

THE PROSPECT of a large attendance at the forthcoming convention of the National Association of Master Steam and Hot Water Fitters in Boston may not be an indication of a revival of business in the steam fitting trade, but it certainly will be looked upon as a sign of renewed hopefulness which has permeated this section of the business world. Business has resumed, in a way, though still far below its normal level. But the signs are all healthy and it is just such happenings as a well-attended and enthusiastic convention of business men that will help along the prosperity movement.

IT IS to be hoped no untoward action will develop at this important meeting of the steam fitting fraternity that will, in any way, work to the disadvantage of any portion of the trade at so critical a juncture as the present. The future is brilliant with promise and those engaged in the heating business have a responsibility that might very easily extend beyond the limits of their own organization in the actions now taken. It may be a very good time to make the most of the present condition of affairs and leave to more propitious occasions the working out of those refinements in trade ethics that are bound to come sooner or later, if they are in the line of reason and justice.

DURING its entire career the National Association of Master Steam and Hot Water Fitters has been notable fully as much for the things it has not done as for those it has done. Its course, in the main, has been marked throughout by a spirit of conservatism that has lent dignity to its transactions and impressiveness to its proposals. Proper credit should be extended where it is due and, in this case, it belongs to a group of leaders who have shown, in the office of president, that keen judgment and foresight that has brought the organization to the position it has occupied until now of power and influence. It is no secret that the times are far more critical for association effort as pursued by such organizations than it is for those confined to the selling end of the business, and for this reason, if for no other, it would seem to be the dictates of policy to work for measures that will enlist the support of all concerned rather than for those involving a radical difference of opinion.

WE HAVE spoken before in these columns of the matter of credits. The fact that scarcely a week passes without reporting the financial difficulties of some heating contracting firm is enough in itself to make the subject one of particu-

lar pertinence, but when the additional fact is stated that the list of liabilities frequently includes obligations to manufacturers or jobbers, or both, involving thousands of dollars, it seems to furnish ample reason, if such were needed, for working out this matter from an association standpoint to a degree beyond what has been accomplished heretofore. The time has not yet passed when contracts for steam fitting work are taken at figures actually involving a loss to the contractor, but taken with the hope, sometimes, of bolstering up a declining business but, more often, of gaining a reputation that will stand him in good stead when more profitable opportunities occur.

If such a man's financial responsibility were a subject of association inquiry, it would redound not only to the benefit of the dealer who is asked to sell him goods but equally as much to the reliable contractors in reducing the number of "below-cost" contracts.

CLOSELY associated with the same subject is the prevailing practice in almost all lines of business of discounting bills either for cash (ten days), or for payment within some other specified time. These annual conventions of the master steam fitters, it must be remembered, are the only times when the dealers and contractors in this line of business really come together as a body. One of the most interesting developments of these conventions in recent years is the closer relation that is being established between the buying and selling branches of the business. Why, therefore, is not such a time an opportune one to discuss and act upon these matters?

SPEAKING of the lines of association effort, nothing the Master Steam Fitters' Association has ever done has been more effective than the work of the Committee on Osborne Claims. This committee, it will be recalled, was appointed in the early '90's to back up a number of the Association members who were being threatened with persecution for alleged infringement on certain heating appliances. In view of the possibility that such a committee is to be revived at this time, it is interesting to recall some of the results of the committee's work. They are covered briefly but thoroughly in the report of the executive committee at the 1894 convention of the association. This report stated:

"In connection with the Osborne suits, we have to report that but one prosecution has been undertaken this year, and that against a member of the executive committee (Mr. Curran). We wish to call to your attention that this feature again emphasizes the importance of our association.

"While we believe there is no validity in the patents held by the Osborne Engineering Company, there is no question but that Mr. Curran would have, in this instance, if defending his case single-handed, for prudence sake and as a matter of least cost to himself, considered and accepted some proposition of settlement rather than to have plunged into the uncertain expenses of litigation. It is well to remember that while there have been a number of instances of prosecution by this company, they are insignificant in comparison with the multiplicity of cases that would have been brought in the event of there having been no association and no arrangement for a combined defense."

Ventilating a House With Cave Air

In Page County, Virginia, a mile from the town of Luray, stands a house that is perfect in its ventilation, and whose inmates breath as pure air as any house dwellers in the world. The house is built on top of a hill, above the famous Caverns of Luray.

Connecting the caves with the surface is an artificial airshaft. Connecting this shaft with the house is a large passageway, and through this passageway air from the caves is pumped into the house at the rate of 8,000 cu. ft. a minute. "Limair," the name of this unique homestead, is the result of years of labor and preparation. T. C. Northcott, who built and owns the house, is a retired heating and ventilating engineer. It had long been his dream to secure property on which could be built a house embodying some pet theories, one of which is to the effect that air filtered through limestone is pure and healthful and aseptic. Now, as to the practical advantages; in the first place the entire cubic contents of the house is changed every four minutes during the day and night, so there is never any foul air. As the air is practically germless, no sickness can ever be contracted in the house from germ causes. As the ventilation is so perfect, windows need never be opened except for cleaning them, and the result is a house which is nearly dustless. As the air supply from the caverns fluctuates in temperature only two degrees in the year, from 54° to 56° F., the temperature of the house is under absolute control. On the hottest day in summer the interior of the house is cool and comfortable at 70°. An open fire can be built every night in the year with comfort, and is built frequently even during the summer. In the winter, the cave air, slightly warmed by passing over steam coils heats the house, and the inside is always at 70°—or whatever the particular temperature desired may be. Finally, the humidity is always normal in "Limair"; it is regulated to 70% at a temperature of 70°. Less is too dry; more, too damp.

TESTS SHOW PURE AIR

Tests have been made with culture mediums and plates to determine the amount of bacteria in the cave air, and all but very few of the results were entirely negative, the two or three positive results revealing so minute a quantity of germs as to be practically negligible. It is interesting to compare the results made in differest localities. For instance, on tests made in the caverns, in various parts, on twelve plates there were two colonies. In nine plates in the house, six colonies resulted, in one test.

In one plate in a nearby farm house, perfectly clean and considered a fine dwelling, 143 colonies resulted. On one plate made in a city back yard, 450 colonies resulted. On one plate made in a New York street car 1,600 colonies resulted. Two plates in the finest operating rooms in Johns Hopkins University showed 65 and 58 colonies. In other words, the cavern air is practically germless, aseptic and pure.

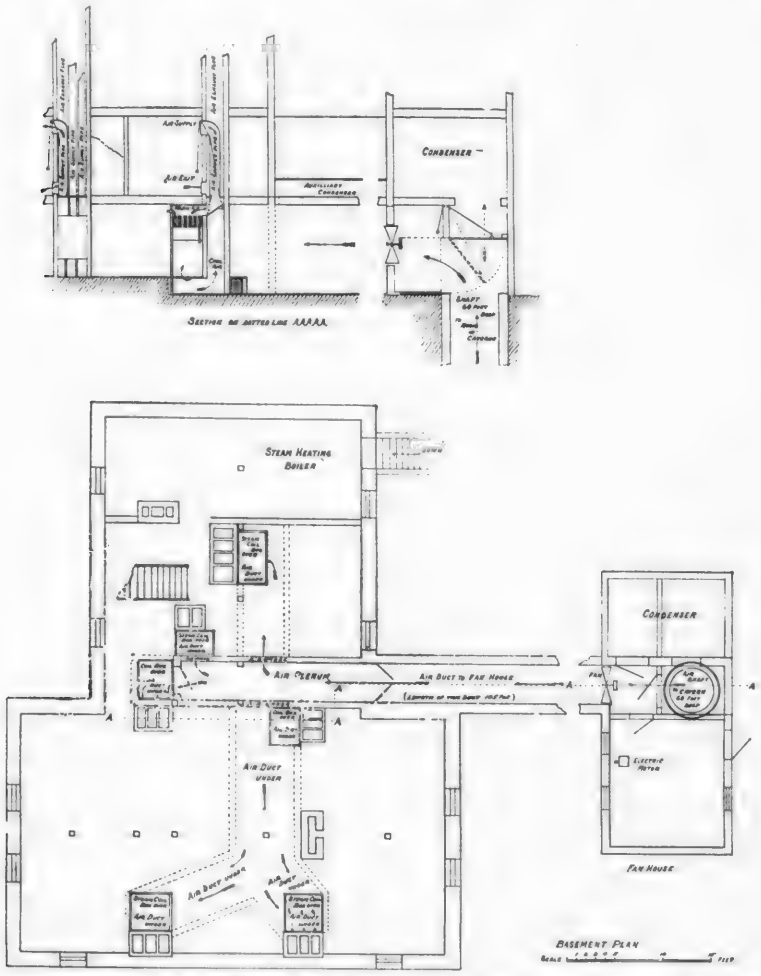
How can the air from a dark, damp cavern be pure and sweet like the air which is sunlit and constantly moving? All the air in the cave is drawn from outdoors, and has been sun-cured. Moreover, it is not stagnant air; the difference in the temperature from inside and outside keeps up a constant circulation of air, which is drawn in and exhaled through thousands, probably, of small openings in rock and earth. The air is filtered through limestone.

LIMESTONE FILTERED AIR

Cave air—lime-cave air—is considered ideal for all troubles of the throat and lungs; consumptives have, before now, tried living in caves. But the lack of sunlight and the dampness did more harm than the pure air did good. But in "Limair" one has the pure air and the sunlight and the lack of dampness altogether.

Some details as to the practical arrangement of this house may be in-

teresting. The location of the house was first determined from the outside. Then a survey was run in the cave through a passageway entirely off the regular "run" for visitors, and this survey was made entirely by candle light. The survey comprised a great many twists and turns and great difference in elevation. The same distance and direction were surveyed on the outside, and a 35-ft. shaft, 5 ft. in diameter, was sunk. When the shaft broke through into the cave, a plumb, dropped from above, was within 3 in. of the corresponding stake in the cave. The shaft drops 35 ft. through the hill, and the top of the chamber into which it breaks is 25 ft. from the floor, so the total depth is 60 ft. The shaft house where the fan is located is 100 ft. from the house, and connected thereto with the air ducts shown in the illustration. This passage is double, the top being of tin and the bottom of wood. The metal duct is used both as condenser and to warm the air slightly by sunlight when desired; the lower chamber is used when it is desired to have the air reach the house just as it comes from the cave.



PLAN AND ELEVATION OF THE BASEMENT, AIR DUCT, AND AIR SHAFT

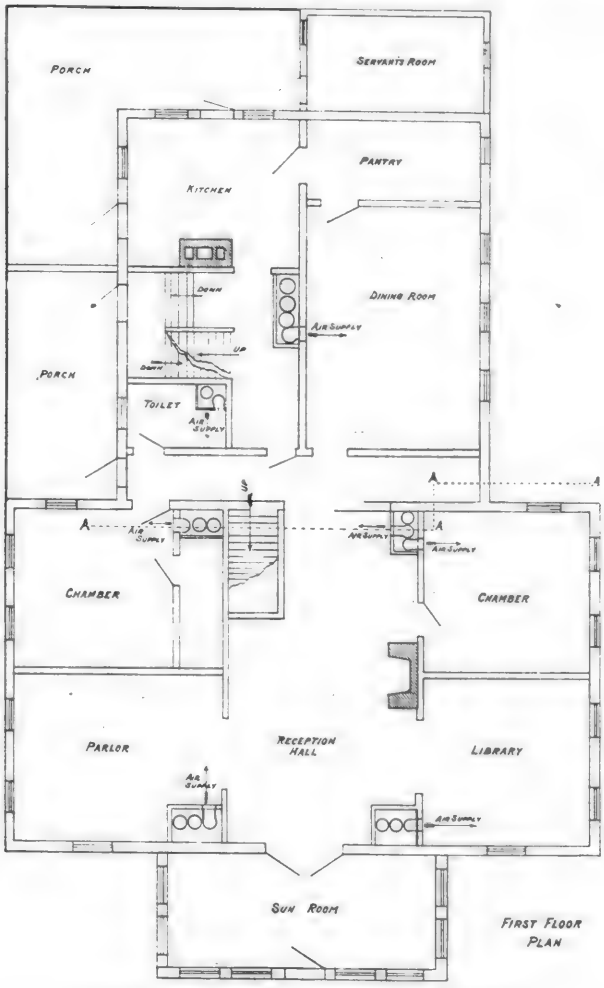
FREQUENT CHANGES OF AIR

All the air goes to a large plenum chamber in the basement. From here it flows up through smaller shafts to the various rooms in the house. At the base of each of these smaller

shafts is a steam coil, which is heated in winter time. A valve is so arranged to each ventilator shaft exit that the warm or cold air can be turned on at will. Above the top ventilator is a paper napkin, which is blown out at a right angle by the force of the air coming in. At the bottom ventilator, where the vitiated air goes out to be discharged out of doors, is a candle, the flame of which is deflected inward, showing the current of air. Although the air in the rooms changes completely in from 4 to 6 minutes, there is no draft to be felt at any time or in any place. The air flows, rather than blows.

The air is propelled into the house by a 5 h. p. electric motor, of which 3 h. p. is all that is required. It is a 42-in. fan of the disk or propeller type, with a gasolene engine in reserve in case of accident to the current. The fan runs from 400 to 600 R. P. M.

The accompanying plans show the basement of the house, the first floor and a section through the house and shaft reaching to the cave. They illustrate the effective means taken to control the temperature and relative humidity of the air and to distribute it and deliver it in the required volume to the various rooms in the house.



FIRST FLOOR PLAN, SHOWING AIR SHAFTS

THE VENTILATING SYSTEM

As the air comes from the shaft it

may be thrown directly to the passage leading to the house, or, by means of a by-pass valve, be sent through a condensing chamber before it reaches the fan. It is here that the relative humidity of the air is regulated. After leaving the fan the air goes through a duct, 4 ft. square x 105 ft. long, to the plenum chamber in the basement of the house. From the plenum chamber reach six different passageways for air, all below the floor level. From all of these six locations or distributing centers rise iron pipes 12 in. in diameter, and one of these pipes goes to each room in the house. These pipes are placed within large metal-lined flues. The central pipe carries the fresh air, and the flue about it carries off the vitiated air—if air which has been in a room four minutes can properly be called vitiated. The large ventilating flues continue to the attic, where they all open into a "gathering chamber," from which the air which has been throughout the house passes to the outside air again.

At the base of each pipe through which air is supplied to the rooms of the house is a mixing valve, controlled by a cord passing through the pipe to the room the pipe supplies with air. This valve controls the temperature of the air reaching a room, by determining the proportions of normal cave temperature and steam heated cave air which are to form the body of air delivered to the room. —C. H. CLAUDY, in the *Scientific American*.

Relative Capacities of Pipes.

EDITOR HEATING AND VENTILATING MAGAZINE:

The writer has read with considerable interest Mr. John Jaeger's article on the "Relative Capacities of Pipes" in the issue of May, 1908. Mr. Jaeger is correct in his statement of the general expression for the friction head in pipes, namely $h = c\frac{l \times v^2}{d \times 2g}$, but has made an error in his reduction which affects the result seriously. He assumes that c in the above equation is constant, and independent of both diameter and velocity, even though he states below that c varies with the velocity. My reason for making this statement is, that in his equation between the friction heads of two pipes, he assumes that the diameters are different and then proves that in order to make his equation a true one, the velocities must be different, and finally assumes that c is independent of both, and cancels it out. Now, c is not independent of both diameter and velocity, nor is it a function of the velocity, but depends for its value on the diameter of the pipe and certain constants. It is independent of velocity, and cannot be cancelled out in equating the friction heads of two pipes of different diameters. The writer gives below Rankine's expression for the friction head of a pipe of circular cross-section running full and then reduces it to the form of Mr. Jaeger's equation, to show the actual value of c:

$$\text{Rankine,}\quad h = .005\left(1+\frac{1}{12d}\right)\frac{lb}{A}\times\frac{v^2}{2g}$$

in which h = friction head in feet
d = inside diameter in feet
b = inside circumference in feet
l = length of run in feet
A = inside area in square feet
v = velocity in feet per second
and g = 32.16.

Now, changing the equation so that d may be expressed in inches, which is the common method of designating pipe sizes, and remembering that $\frac{b}{A} = \frac{4}{d}$, we have,

$$h = .005\left(1+\frac{1}{d}\right)\frac{48l}{d}\times\frac{v^2}{2g}$$

$$= \left[.24\left(1+\frac{1}{d}\right)\right]\frac{l \times v^2}{d \times 2g}$$

from which it may be clearly seen that

$$C = \left[.24\left(1+\frac{1}{d}\right)\right]$$

and is a function of the diameter, but independent of the velocity.

We may now proceed to equate the friction heads of the 4-inch pipe and that of the 1-inch pipe, using the subscripts 4 for the 4-inch pipe, and 1 for the 1-inch pipe:

$$2.4\left(1+\frac{1}{4}\right)\frac{l_4 \times v_4^2}{4\times 2g} = .24\left(1+\frac{1}{1}\right)\frac{l_1 \times v_1^2}{1\times 2g}$$

$$.075\ v_4^2 = .48\ v_1^2$$

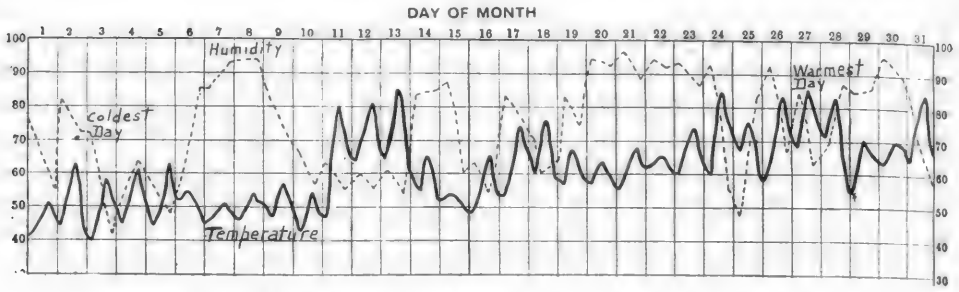
$$v_4^2 = 6.4\ v_1^2$$

$$v_4 = 2.53\ v_1$$

instead of $2v_1$ as deduced by Mr. Jaeger. This, then, would call for $2.53 \times 16 = 41$ 1-inch pipes, instead of 32 as shown in his article. This is considerably in excess of the value given by Prof. Carpenter, but is correct according to the accepted formula for friction head.

ROY E. LYND.

Dover, N. J., June 8, 1908.



TEMPERATURE AND HUMIDITY RECORD FOR NEW YORK FOR MAY, 1908

The Weather for May

As announced in a previous issue, we have arranged to continue during the summer the publication of the weather charts showing the weather conditions in five representative American cities. These charts have become a permanent feature of THE HEATING AND VENTILATING MAGAZINE, and the data they contain are not to be found elsewhere, the information being compiled from government weather bureau records that are not ordinarily made public.

For the purposes of the heating and ventilating engineer the only information of practical value during the summer months is a record of the temperature and humidity variations. The wind velocity and direction, and also the character of the day, will, therefore, be omitted during the warm months, but this information will again be incorporated in the charts commencing with the opening of another heating season in October.

NEW YORK

The highest temperature in New York during May was 86° on the 27th, and the lowest 40°, on the 3d. The greatest daily range was 33° on the 11th, and the least daily range 5°, on the 15th. The mean temperature for the month was 61°, or 1° above the normal for 38 years. The rainfall broke all records, totaling 9.10 in., of which 4.17 in. fell on the 7th and 8th.

BOSTON

In Boston the highest temperature was 88°, on the 27th, and the lowest 39°, on the 3d. Greatest daily range, 37°, on the 11th; least daily range, 4°, on the 7th. The mean temperature for the month was 59°, 2° above the average for 38 years. Total rainfall, 3.78 in.

ST. LOUIS

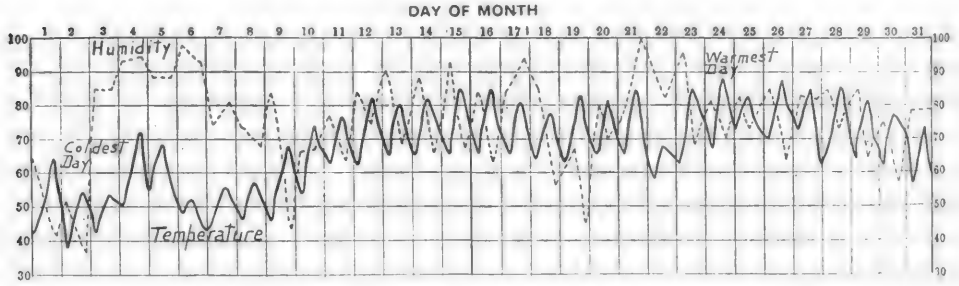
Highest temperature, 89°, on the 24th; lowest temperature, 38°, on the 2d. Greatest daily range, 22°, on the 4th; least daily range, 7°, on the 6th. Mean temperature for the month, 67°, 1° above the mean of this month for 36 years. Rainfall, 7.72 in.

CHICAGO

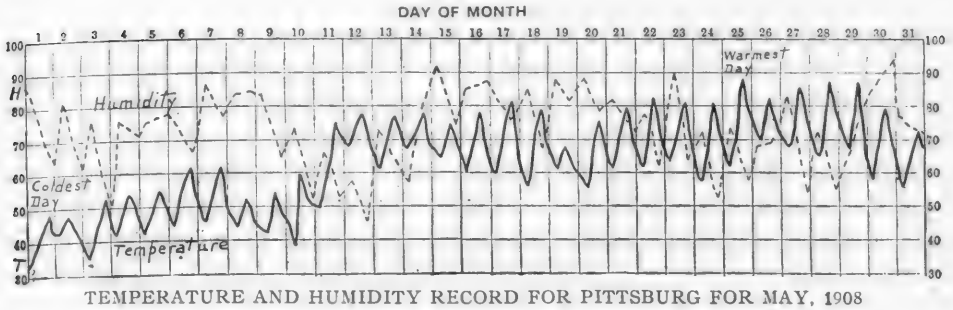
Highest temperature in Chicago during May, 87°, on the 25th; lowest temperature, 34°, on the 2d. Greatest daily range, 33°, on the 12th; least daily range, 3°, on the 7th. Mean temperature for the month, 59°, 2° above the mean of this month for 38 years. Total rainfall, 6.74 in.

PITTSBURG

Highest temperature, 89°, on the 25th; lowest temperature, 33°, on the 1st. Greatest daily range, 27°, on the 25th; least daily range, 7°, on the 19th. Mean temperature for the month, 63°, which corresponds to the normal for 38 years. There was a total rainfall during the month of 3.69 in. There was also a flurry of snow on the 1st, amounting to 0.1 in.



TEMPERATURE AND HUMIDITY RECORD FOR ST. LOUIS FOR MAY, 1908



TEMPERATURE AND HUMIDITY RECORD FOR PITTSBURG FOR MAY, 1908

Trade Literature

"Facts Are Stubborn Things." A Few Relating to Wall Radiators, is the title of a circular issued by Fowler & Wolfe Mfg. Co., Philadelphia, that contains some terse, convincing points regarding the high quality of the goods made by this firm. Fowler & Wolfe wall radiation, it states (and no other, installed in any form), has at intermediate intervals circulating return pipes that provide direct passage for the wet, cool steam in high pressure work, the water of condensation in low pressure steam work, and the cooled water in hot water systems, to the lowest tube, thereby ensuring an evenly heated surface upon all parts of the radiator except the lowest part of the bottom tube, which is fractionable. This principle is equally applicable to either one or two pipe steam or hot water system. Its durability as against wrought iron or steel pipes is stated to be about as 5 is to 1.

Included in the circular is a summary of results of tests to determine the relative efficiency of wrought-iron pipe coils as against Fowler & Wolfe wall radiation, which confirm the claims as to the greater efficiency of the wall radiators.

Practical Sound Deadening and Weather Proofing, a circular published by the H. W. Johns-Manville Co., New York, illustrates and describes the construction of Keystone Hair Insulator, which is made of cleansed, sterilized cattle hair fastened between two layers of non-porous paper. As a sound-deadener, the sound waves strike the paper, which in turn is pressed against the hair and cellulose cushion, thus driving back and dissipating the sound. The circular also includes illustrations showing the method of applying Keystone Hair Insulator to side walls, partitions and floors of frame construction for weather-proofing purposes.

"The Potter" Mesh Separator is exhaustively explained in a newly issued illustrated catalogue published by the Potter Separator Co., Newburgh, N. Y. In discussing the use of internal separators in steam boilers, the writer states that the idea is not new, as all steam users are acquainted with the ordinary boiler dry pipe, which is a form of steam separator, though crude and inefficient, first, because the steam and water encounter but one indifferent baffle, and, second, its diameter is made about the same as that of the nozzle on the boiler, with the result that the steam, instead of passing slowly through it and thus giving time to the water to fall to the bottom, rushes through, carrying nearly all the water with it into the steam main. The Potter Mesh Separator, designed to overcome these defects, consists, in its simplest form, of about 30 pieces of wire screen separated by distance rings, all bolted to a head casting and hung to the boiler shell or steam drum. Connection to the steam outlet is made by an adjustable cast-iron sleeve, or a galvanized sheet-iron sleeve, where the former cannot be used. The area of cross-section of this device is several times that of the boiler outlet, thus giving time for the separated moisture to flow to the bottom of the separator. This action is described by the writer, and a number of views of different types of the apparatus are shown to illustrate various features of its operation. Included in the catalogue are the results of tests with Potter mesh separators conducted at the Great Northern Hotel, Chicago, in March, 1907, which show what can be accomplished in the way of a cure for priming boilers. The catalogue concludes with a table showing the loss of heat, and corresponding coal, due to moisture of steam at the boiler outlet. Pp. 13. Size 6 x 9 in. (standard).

Cash Standard Pump Governor and Regulating Valve; also the same valve auxiliary operated for very exact intermittent service, are shown and described in Bulletin No. 10, issued by the manufacturer, A. W. Cash, Newark, N. J. The valve is made 1-4 to 10 in. and for auxiliary-operated duty, 1 to 10 in. Among the notable features of this valve are the compensated double springs, with single seat. The diaphragms are made of phosphor bronze. The bulletin contains a price-list for each size up 6 in. and other detailed information, with directions for installation.

Modern Steam Specialties are explained in a catalogue issued by Kieley & Mueller, 34 West Thirteenth street, New York. They have placed several new specialties on the market which are meeting with much success. They consist of an extra high pressure reducing valve, non-return stop and check valve, new steam trap, outside air dash pot back pressure and relief valve, hot water temperature regulator, new grease extractor and muffler tank and feed water heater. In addition to these new specialties, they manufacture a number of other high grade specialties, including reducing valves for all purposes, steam traps, damper regulators, steam separators, grease extractors, pump regulators, water pressure regulators, water feeders, high pressure boiler feeders, feed water regulators, grease and oil traps, water arches, low water alarms, high and low water alarms, strainer connections, drip tank controllers, float valves, pump governors and receivers, combination muffler and grease extractor, grease extractor and purifier and waste heat utilizers. Catalogues and circulars of new specialties are gladly furnished, we understand, to anyone interested by addressing Kieley & Mueller, 34 West Thirteenth street, New York.

Webster System of Steam Circulation for Heating Purposes is described in a new edition of the general catalogue, published by the manufacturers, Warren Webster & Co., Camden, N. J. Since the publication of its previous catalogue over 1,000 new installations of the Webster system have been made, which have enabled the company to perfect the various details connected with this method of utilizing exhaust steam, all of which are pointed out in the new catalogue. New engravings, showing the Webster specialties in tint, add to the attractiveness of the catalogue. Size, 6x9 in. (standard). Pp. 32.

Broomell's Vapor System of Heating, published by the Vapor Heating Co., Philadelphia, Pa., is a handsomely illustrated catalogue which contains many detail illustrations in half-tone of the apparatus, together with plans of typical installations. Size, 6x9¼ in. Pp. 64.

"Sure Seal" System of Steam Circulation, W. E. Tillinghast patents, owned by the Central Supply Co., Worcester, Mass., is a new system of vacuum heating described in an advance catalogue, just issued. The special devices on the system are a "Sure Seal" tee, of novel design, attached to the return end of the radiator, which allows water and air, but not steam, to leave the radiator, and a "Sure Seal" generator, which is designed to eliminate all excessive back pressure on the engines, pumps, etc. The system, it is stated, will operate on live steam reduced to a pressure below atmosphere and will keep the radiating surface full of live steam under 1-in. of vacuum on the returns. It is described as a low tension system carrying from 1 to 5 in. of vacuum on the return end and no back pressure on the engine exhaust. There is no moving or removing mechanism in the return connections, nor are there any air valves or return valves.

Pierce Herald for June, in its leading article, discusses the subject of Residence Heating, showing the possibilities in this direction with modern steam or hot water heating apparatus. The article is illustrated with various types of boilers and their adaptation to different conditions. The issue contains a number of other interesting items connected with heating work. The *Pierce Herald* is published by the Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., in the interests of the heating and plumbing trade.

Plant of A. A. Griffing Iron Co. Sold.

Frank P. McDermott, of Jersey City, receiver for the A. A. Griffing Iron Company of that city, has been authorized in Newark by Vice-Chancellor Howell to accept a bid of $110,060 for the real estate, machinery and patents belonging to that concern. The bid was made by the Hematite Products Company of East Orange.

Thomas H. Prest, formerly president of the Prest Heating Co., Kansas City, Mo., has located in New York with offices in the Singer Building, 149 Broadway, as manufacturers' agent for fans, blowers and exhausters, heating, ventilating and drying apparatus. Mr. Prest is well-known to the heating trade in the East as well as in the Middle West, where he has been associated with the heating business since 1875. He would be glad to correspond with manufacturers with a view to handling heating, plumbing and hardware specialties.

H. W. Johns-Manville Co., New York, announces the opening of a branch office in Indianapolis, Ind., to take care of the local requirements of the trade in that territory. This office, which is located at 30 South Pennsylvania street, Indianapolis, will be under the management of Charles E. Wehr, who for several years has represented the company in that section.

Harry J. Marks, mechanical engineer and contractor, has opened an office at 141 Centre street, New York. He will make a specialty of devices for the control of high pressure and superheated steam.

TRADE AND MISCELLANEOUS NOTES

Coming Events

Summer meeting, American Society of Mechanical Engineers, Detroit, Mich., June 23-26, 1908.

Joint meeting of Supply Associations, Detroit, Mich., June 24, 1908.

American Society for Testing Materials, Atlantic City, June 23-27, 1908.

Annual convention, National Association of Master Plumbers, Boston, Mass., July 14-16, 1908. Headquarters at Hotel Lenox.

Summer meeting, American Society of Heating and Ventilating Engineers, Niagara Falls, July 24-25, 1908.

Deaths

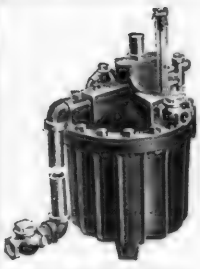
William Harkness, for 20 years treasurer of the Philadelphia Master Plumber's Association, died at his home in Philadelphia. He was 71 years old.

Miscellaneous Notes

James W. Van Cleave, president of the Buck Stove and Range Co., St. Louis, Mo., was re-elected president of the National Association of Manufacturers at its recent annual meeting in New York.

National Association of Master Heating and Domestic Engineers, of England, which held its fourth annual convention recently in London, re-elected D. M. Nesbit as president and treasurer. Other officers elected are: Vice-president, J. H. Clements; council members, C. I. Haden, A. W. May, S. Saunders, T. Taylor, J. A. Dargue, W H Granville, H S. Moorwood, J. N. Russell, R. Crittal and W. White.

Milwaukee, Wis.—The strike of iron molders in Milwaukee was declared off by the local union, following an announcement on April 23 that no more strike benefits would be paid by the national union after May 5.



CLASS A RETURN TRAP

—ESTABLISHED 1870—

The Albany Steam Trap Co.

ALBANY, N. Y.

Manufacturers of

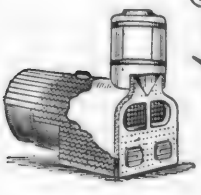
RETURN STEAM TRAPS, NON-RETURN STEAM TRAPS, PUMPS, PUMP GOVERNORS. ALSO HIGH GRADE STEAM VALVES

Our 37 years' experience in this line is worthy of your attention

JAMES H. BLESSING, President

THOMAS F. RYAN, Sec. and Treas.

TELEPHONE CALL 6097 FRANKLIN.



ROBERT A. KEASBEY CO.

HEAT AND COLD INSULATING MATERIALS

HEADQUARTERS FOR 85% MAGNESIA, ASBESTOS AND BRINE PIPE COVERINGS, ASBESTOS PRODUCTS, ETC.

ESTIMATES FURNISHED AND CONTRACTS EXECUTED.

100 NORTH MOORE ST, NEW YORK CITY.

Milwaukee, Wis.—Plankinton Light & Power Co. will extend its tunnel west from Third street with the purpose eventually of furnishing light, heat and power in all of the territory bounded by the Milwaukee river, Sixth street, Wells street and Clybourn street.

Chicago, Ill.—Ninety-four employees of the Hess Warming and Ventilating Co., Western avenue and Twelfth street, went on strike as the result of the company's refusal to arbitrate difficulties. All members of the Associated Building Trades Association walked out.

Davenport, Iowa.—The discontinuance by the Peoples Light Co. of the steam heating service has brought up prominently the agitation for a new downtown service. Property owners affected by the action of the company will be put to an expense of from $25,000 to $40,000 to provide a new system, for many have found their old boilers entirely rusted out. The Peoples Light plant is a part of the old Davenport Gas & Electric Company's system. The directors gave as a reason for discontinuing the service that the heating plant had run behind $15,000 the past winter. It is also badly out of repair.

Rockford, Ill.—Alderman Edward F. Carty has pleaded guilty to a charge of having accepted a bribe of $500 from the Central Heat & Power Co. for the purpose of securing his vote for an ordinance extending the company's franchise.

Minneapolis, Minn.—Archambo Heating & Plumbing Co. is building new quarters at 317 Fifth avenue, South, to be 80 x 132 feet, two stories high and basement, of brick and mill construction. The building will cost $40,000. The Archambo Co. will occupy the basement and one store front.

Anniston, Ala.—Enterprise Oil & Heating Co. will operate a system of heating by the use of fuel oil. The company has secured a franchise to lay underground conduits in the streets.

W. M. Mackay, secretary of the American Society of Heating and Ventilating Engineers, and president of the Mackay Mfg. Co., received an additional honor last week by being elected president of the St. Andrews Society of Newark, N. J., of which he has been an active member and officer for the past ten years.

Walter B. Snow, publicity engineer, has recently increased his facilities by removal to larger quarters at 170 Summer street, Boston, Mass.

Building Operations during April, with the exception of those in some southern cities, continued to reflect the depression in business which has existed throughout the past winter. The figures, however, showed a tendency toward normal conditions in the middle west, and several cities in that section reported increases over last year's operations for the same period. In the eastern cities the decrease was 33 per cent.; middle west, decrease, 1 per cent.; southern, increase, 20 per cent.; Pacific Coast, decrease, 51 per cent.

Manufacturers' Notes

Youngstown Furnace & Supply Co., Youngstown, O., will build an additional building, 50 x 200 ft., of brick, and two stories high.

Pittsburgh Valve, Foundry & Construction Co., Pittsburg, will supply the piping, valves and fittings, running up to 18-in. diam., for the plant of the Vesta Coal Co., California, Pa.

A. H. Busch Co., San Francisco, Cal., has purchased the stock of J. D. Hooker Co., consisting of heating and plumbing supplies.

Demarest Heater Co., which recently moved its plant to Springfield, Mass., is located at 41-43 Taylor street and is now in full operation. The company manufactures a combination warm air and steam heater, formerly a part of the product of the Innes-Demarest Stove and Heater Co., of Binghamton, N. Y.

United States Heater Co., Detroit, Mich., announces that its Omaha branch has taken larger quarters at 916 Farnam street. The company will occupy the entire building, which is four stories in height and basement.

Richard W. Chapman Co., Chicago, dealer in pipe and boiler covering, has moved to 2656-2658 No. Hamlin avenue.

Pressed Radiator Co., Pittsburg, Pa., manufacturer of sheet-metal radiators, has moved its New York office to 227 Fifth avenue. J. Barton Garfield is the company's New York representative.

American Blower Co., Detroit, Mich., has taken over the foundry of the Northwestern Foundry & Supply Co., in that city.

Wm. H. Page Boiler Co., Meadville, Pa., will establish its general offices at 9-15 Murray street, New York. W. P. Davenport has been appointed general sales manager, succeeding John H. Young. Arthur Sawyer has been transferred from the Philadelphia office to the Boston office of the company. C. Theodore Campbell, of the New York office, has been appointed local manager of the company at its plant in Meadville.

P. R. Jennings, senior member of Bruce & Cook, New York, metal dealers, was elected president of the New York Metal Exchange, March 30.

Business Chances

South Bend, Ind.—Property owners in the square between Main and Mill streets, and bounded by Second and Third streets, are planning to form a central station heating company to heat the business buildings and residences within that square.

Tipton, Iowa.—The school board will issue bonds for $4,500 to build a heating plant for the high school.

Baltimore, Md.—Four thousand dollars has been raised by the Nursery and Child's Hospital toward the installation of a heating plant.

Jackson, Miss.—Plans and specifications have been prepared for the new library building of the Industrial Institute and College at Jackson, including heating, plumbing, wiring, furnishing, etc., the building complete to cost $25,000.

Kalamazoo, Mich.—Brush, Allen & Anderson, of Detroit, are drawing plans for the separate heating plant for the Woodward Avenue school building in Kalamazoo. The plant will cost $4,000.

Green Bay, Wis.—The Committee on Insane of the Board of Supervisors has recommended a new heating plant for the insane asylum, and condemns the present system as inadequate.

Waukon, Iowa.—The school board has adopted plans for the heating of the school building, which provide for a separate building for the heating plant.

Salt Lake City, Utah.—Plans for the new central heating plant to furnish heat to the city buildings are being prepared by the architects.

Chicago, Ill.—The new 12-story million-dollar building to be built at Monroe and Franklin streets for Hart, Schaffner & Marx, clothing manufacturers, will be made dustproof and will be equipped with an up-to-date ventilating system, including apparatus for washing and purifying the air. A refrigerating system will be used to cool the air in summer and sterilize and cool the drinking water. It is planned to begin construction by January 1, 1909. Holabird & Roche are the architects.

Superior, Wis.—Manager Marchy, of the Taylor Institute, is having the basement under the main building enlarged and will install a hot water heating system.

Salt Lake City, Utah.—Forty thousand dollars in bonds will be issued in the Jordan school district to provide for new school buildings at Riverton, Dalton, Lark and Upper Bingham. The proceeds of the issue will also provide for the removal of furnaces and other heating plants in a number of old school buildings to separate structures, which is according to a policy recently adopted.

Richmond, Va.—The Council Committee on Annexed Territory has authorized the completion of the heating plant in the Fairmount school at a cost of $3,500.

Topeka, Kan.—Plans for heating and ventilating Representative Hall at the State Capitol have been drawn by the State architect, John F. Stanton, under an act of the last legislature providing $5,000 for a new plant.

Wauwatosa, Wis.—At a special vote taken to determine the question of whether bonds should be issued to provide for ventilating systems for the local schools, the ayes had it, aided by a large vote by the women.

Washington, D. C.—Sealed proposals will be received at the office of the Supervising Architect, Treasury Department, for the following-named work:

Until June 22, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Provo, Utah.

Until June 29, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Sumter, S. C.

Until June 30, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Leadville, Pa.

Until July 1, 1908, for the construction and mechanical equipment (except plumbing) of an extension to the U. S. Post Office, Court House, etc., at Baltimore, Md.

Until July 2, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Columbia, Tenn.

Until July 7, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Iola, Kan.

Until July 9, 1908, for the construction (complete) of the extension to the U. S. Post Office at Springfield, O.

Until July 14, 1908, for the construction (including plumbing, gas piping, heating apparatus, electric conduits and wiring) of the U. S. Post Office at Sharon, Pa.

New Incorporations

Sanitary Heating Co., Brooklyn, N. Y. Capital stock, $400,000. Incorporators: William H. Schofield, William J. Wilson and William E. Wilson, all of New York.

Stott Heating System Co., Chicago, capital $10,000, to manufacture heating

specialties. Incorporators: H. E. Argo, C. E. Feltes and T. J. Fell.

National Automatic Heater Co., Kittery, Me. Capital stock, $500,000. President and secretary, J. W. Hawes; treasurer, A. H. Peavey; both of Kittery.

North Shore Plumbing & Heating Supply Co., Chicago, capital $10,000, to manufacture heating and drainage supplies. Incorporators: W. J., E. C. and J. Bristow.

John T. Young Boiler Co., Norwich, Conn. President, John T. Young; secretary-treasurer, August W. Dodge. Both principals were formerly with the Wm. H. Page Boiler Co. A full line of steam and hot water heating boilers, under the name of Norwich, will be placed on the market.

Trimble & Lutz Supply Co., Wheeling, W. Va., capital $200,000, to take over the steam and mill supply business of Trimble & Lutz Co. Incorporators: T. C. and H. A. Hornbrook, H. A. Ebbert, George Hook, G. W. Lutz and John A. Hess, all of Wheeling.

L. E. Smith Co., Gloucester, Mass., capital $30,000, to conduct a heating, plumbing and hardware business. President, D. Chester Tarr; treasurer, Roger H. Tarr; secretary, Horace Tarr.

Jacob Blum Co., Booklyn, N. Y., incorporated to conduct a steam heating contracting business.

Atlas Heating & Ventilating Co., San Francisco, Cal. Capital stock, $10,000. Incorporators: W. G. Sadler, L. B. Sadler, R. N. Osborn, H. F. Bryant and J. V. Chase.

Sanitary Construction & Heating Co., Duluth, Minn. Capital stock, $50,000. Incorporators: George and W. E. McGurrin and J. L. Smith.

Joseph F. Grosswiller Supply Co., Toledo, O., incorporated to take over the heating and plumbing supply business conducted under the same name. President, treasurer and general manager, Joseph F. Grosswiller; vice-president, C. B. Grosswiller; secretary, Charles Keplinger; assistant secretary and treasurer, N. Kohn. It is the purpose to conduct the company on a coöperative plan, so that the employees may share in the profits of the company.

Wallingford Plumbing & Heating Co., Wallingford, Conn. Capital stock, $10,000. Incorporators: John P., Edward L. and Thomas J. Bowe.

Ross-Johnston Co., Bloomington, Ill., capital $6,000, to conduct a heating and plumbing contracting business. Incorporators: William and A. H. Ross and William Johnston.

Gallaway & Geiss Plumbing & Heating Co., Kansas City, Mo. Capital stock, $3,000. Incorporators: William T. and May A. Gallaway and Louis N. Geiss.

Harmony Hardware Co., Harmony, Pa., incorporated to conduct a heating and plumbing contracting business and to deal in hardware, wholesale and retail. Incorporators: Jacob Dambach, John Schiever, H. H. Beighlea, James Welsh and S. O. Wright.

Lebanon Heating Co., Lebanon, Ind. Capital stock, $75,000. Directors: George W. Norwood, Joshua W. Shelby, Phil. Adler, Demetrius Tillotson, William J. De Voe, Fred M. Bechtell and Charles A. Gilham.

Noble Plumbing & Heating Co., Princeton, Ind. Capital stock, $5,000. Directors: Ernest E., M. E. and Clyde E. Noble.

Taylorville Railway, Light, Heat & Power Co., Taylorville, Ill. Capital stock, $5,000 (nominal). Incorporators: James A. Adams, I. J. Perkins, Alice M. Moore, W. L. Adams and Albert Morgan.

Excel Electric Heating Co., Newark, N. J. Capital stock, $40,000. Incorporators: Richard W. Osland, Edgar B. Drake and Edwin G. Russell.

D. G. C. Valve Co., New York, capital $300,000, to manufacture heating, ventilating, drying and refrigerating systems and appliances. Incorporators: Leo A. McTighe, Chauncey Matlock, August E. Heerd, Brooklyn; James H. Davis, New York; and Algernon R. Burnett, Hoboken, N. J.

New Firms

Cloquet Plumbing & Heating Co., Cloquet, Minn., is a new contracting firm at that place.

E. R. Lumsden Co., 27 South Sixth street, Indiana, Pa., is a new firm of heating and plumbing contractors.

Van Kanel & Hodges, Rockford, Ill., have opened a heating and plumbing business.

Holzhauer & Murray, 3400 Rutger street, Chicago, is a new heating and plumbing concern.

Cowdrey & Leedle, Harvard, Ill., composed of Grant Cowdrey and Arthur C. Leedle, have engaged in the heating and plumbing business in that place.

Dyer Plumbing & Heating Co., Homestead, Pa., has opened an office as heating and plumbing contractor at 404 West Eighth avenue. The firm is composed of Calvin, J. C. and Clarence Dyer, all of Homestead. A branch office will be located at 152 Jacunda street, Knoxville, Pa.

Pittsburgh Plumbing & Heating Co., 59 No. Mercer street, Newcastle, Pa., has opened a heating and plumbing contracting business.

Fitzmaier & Templeton, 300 Witler avenue, Connellsville, Pa., is a new firm

of heating and plumbing contractors. The principals are L. H. Fitzmaier and Roy Templeton.

Guarantee Plumbing & Heating Co., Pittsburg, Pa., has been organized as contractor for heating, plumbing, gas fitting and electric lighting. The company is composed of I. C. Wilbur, J. T. Moyer and J. F. McNaul.

Henry L. Gebhard & Co., 182 Mulberry street, Newark, N. J., has added to its business a jobbing department in heating supplies.

Taylor Bros., Oklahoma City, Okla., heating and plumbing contractors, have opened an office in the Security building. The firm is composed of James Taylor and F. W. Taylor.

James O'Neill, Lawrenceville, Ill., has opened a heating and plumbing business at that place.

Hadden Heating Co., Chicago, Ill., is a new heating contracting firm, composed of George Hadden and Charles Johnson. Quarters have been established at 86 South Wood street.

Mars Plumbing & Heating Co., Mars, Pa., has opened for business in the Marshall Building as heating and plumbing contractors. W. C. Martin, Mars, is the principal member of the firm.

Kiel Mfg. & Supply Co., Wheeling, W. Va., jobber of heating and plumbing supplies and manufacturer of the Kiel floor gas valve, has started in business at that place. President, Gilbert S. Walker; vice-president and treasurer, Irwin R. Kiel; secretary and general manager, Henry J. Kiel.

Danville Plumbing & Heating Co., Danville, Ill., is the name of a new firm that has opened quarters at 16 North Hazel street. R. H. Carson is one of the principals of the firm.

Kokomo Plumbing & Heating Co., Kokomo, Ind., is a new contracting firm composed of W. C. Hunter and W. Lindley.

Berwick & Schmidt, Johnsonburg, Pa., is a new firm of heating, plumbing, tinning and electrical contractors located in the Stewart Building on Centre street.

Carey & Landes, Defiance, O., have opened a heating and plumbing business at that point.

Business Changes

William Butler & Son, Rockville, Conn., have retired from business as heating and plumbing contractors and dealers in stove and other goods. William Butler has been engaged in the hardware business in Rockville for 61 years.

Lawrence Plumbing Co., Corning, N. Y., has succeeded to the heating and plumbing business of Heerman & Lawrence, of that place.

F. A. Haughey, Elmira, N. Y., heating and plumbing contractor and jobber, has discontinued business.

Prescott Plumbing & Heating Co., Binghamton, N. Y., succeeds the Lestershire Plumbing & Heating Co., at 207 Water street. The principals are C. P. and A. W. Prescott.

David Eyman & Son, Wellington, O., heating and plumbing contractors, have succeeded Grissinger Bros.

Hagerstown Heating Co., Hagerstown, Md., have taken over the business of the Moser Heating Co.

Business Troubles

H. Carruthers & Co., Boston, Mass., has made an assignment, for the benefit of creditors, to Joseph H. Barnes.

Hartford Blower Co., Hartford, Conn., has failed. Herbert S. Bullard has been appointed receiver.

Berlin Lighting & Heating Co., Berlin, Wis., which has been operated by a receiver for several years, will cease operation.

Empire State Engineering Co., Rome, N. Y., and New York City, has been placed in the hands of a receiver.

ESTABLISHED 1875 **Telephone, 211 Cortlandt**

Write for Prices on

FANS, BLOWERS AND EXHAUSTERS, HEATING VENTILATING AND DRYING APPARATUS

THOMAS H. PREST, Mfrs. Agent

149 BROADWAY NEW YORK, N. Y.

Wanted—Two salesmen experienced in selling heating and ventilating apparatus in Greater New York.

Contracts Awarded

Edwin Sterner Co., Flint, Mich., heating and ventilating new city hall, at its bid of $7,420; also heating and ventilating new Stevenson school for $7,225.

John A. Simpson, Lincoln, Neb., Domestic Science building and central heating plant of the Odd Fellows' Home at Lincoln. Domestic Science building contract, $7,486; central heating plant, $8,674.

Piper Bros., Trenton, N. J., power and heating plant in the Soldiers' and Sailors' Home at Vineland. Their bid was $16,392.

T. C. McCarthy, Madison, Wis., has the contract for the building for the separate heating, lighting and power plant for the new State capitol. His bid was $108,000. The plant will furnish heat to 25 buildings now built, with capacity for future buildings. Twelve Babcock & Wilcox boilers will be installed.

Richey & Morgan, El Paso, Tex., heating and plumbing Country Club house at El Paso.

Paine-Ford Co., Ashtabula, O., heating plant for the enlarged school building on the East Side.

Globe Machinery & Supply Co., Des Moines, Iowa, heating addition to the Howard Music Hall and the new apartment house for Drake University at Des Moines.

John L. Reed, Trenton, N. J., central heating plant and heating system for six buildings for the Princeton Theological Seminary at Princeton. The work will cost $39,318.82. H. W. Johns-Manville Co., New York, will construct the underground conduits at a cost of $9,972.82.

Lewis & Kitchen, Kansas City, Mo., hot blast heating and ventilating system for the addition to the Franklin School at Omaha. Their bid was $6,686.

Fred Smith & Co., Geneva, Ill., heating and plumbing new Carnegie Library building at Geneva.

Kees Engineering Co., St. Paul, Minn., heating plant for the Battle Mountain Sanitarium of the National Home for Disabled Volunteer Soldiers. Cost, $1,500.

J. E. Morrisey, Crookston, Minn., remodeling heating plant in city hall.

E. D. Hough, Los Angeles, Cal., steam heating and vacuum cleaning system for three-story apartment building on Grand avenue.

Wm. H. Seddon Plumbing & Heating Co., Columbus, O., heating and plumbing Federal building.

McKay Heating & Plumbing Co., Erie, Pa., hot blast heating and ventilating system for the new high school. Cost, $16,850.

Gilley-Schmid Co., San Francisco, Cal., steam heating Anheuser-Busch Brewing Co.'s new building.

McGinness-Smith Co., Pittsburg, Pa., heating public school building at East Carnegie, Pa.; also steam heating St. Adelbert's Convent in Pittsburg.

A. Burlingame Co., Worcester, Mass., heating and ventilating new chemical laboratory at Vassar College, Poughkeepsie, N. Y., to cost $15,000.

Murray & Richards, Stamford, Conn., heating Y. M. C. A. building in that place.

Jones, Koeknle & Co., heating and plumbing new gymnasium for the Illinois Asylum for the Insane at Lincoln, Ill., for $2,500; also heating Knights of Pythias Home at Decatur, Ill.

Charles Wilkins & Co., Minneapolis, Minn., heating and plumbing school building at Butterfield, Minn., for $2,899.

American Warming & Ventilating Co., heating and ventilating school buildings at Mamaroneck, N. Y., and Highland Mills, N. Y.; St. James' Church and Parish House, Batavia, N. Y.; and parochial school at Fishkill, N. Y.

C. L. Miller, Wallace, Mont., heating library building at State University at Missoula.

Thomas O. Wible, Greensburg, Pa., central steam heating plant for the Westmoreland County Home at Greensburg. Cost, $14,000.

John D. Root, Pittsburg, Pa., steam heating city hall at Uniontown.

Brockway Plumbing & Supply Co., Huntingdon, W. Va., heating and plumbing new Brotherhood building, at Hinton, W. Va.

John O'Hare, Mannington, W. Va., heating and plumbing new Odd Fellows' Home at Elkins. Cost, $10,000.

Becker-Seidel Co., Toledo, O., heating and ventilating new Technical High School in Cleveland.

"THE POTTER" MESH SEPARATOR
OR BOILER DRY-PIPE
DRY STEAM—SAFETY—ECONOMY
POTTER SEPARATOR CO., Newburgh, N.Y. N.Y. OFFICE: 39 Cortlandt St.

Kuhnly Heating and Plumbing Co., Tolland, Conn., heating and plumbing new schoolhouse at that point.

H. P. Cahill, Akron, O., steam heating city hall at Cuyahoga Falls.

Central Supply Co., Worcester, Mass., steam heating new city building for $1,900.

John P. Eldredge, Ellsworth, Me., hot water heating Burrill National Bank building.

Lewis & Kitchen, Kansas City, Mo., heating new auditorium at St. Joseph,, Mo., for $13,728.

Grand Forks Plumbing & Heating Co., Grand Forks, N. D., heating and plumbing new Deaconess Hospital at Northwood for $3,520.

Bedford Electric Co., Milwaukee, Wis., steam heating new Federal building at Green Bay, Wis., for $4.119.

Toledo, O.—Following the recommendations made by the school inspection committee, the Toledo School Board has awarded the following contracts for heating work in the various school buildings: Greenewald & Lang, Walbridge School, $750; Thomas Kewley, Newbury School, $539; Egan Bros., Washington School, $2,227.66; John Waite, Segur School, $1,790; Robert Raitz & Co., Newton School, $2.150, and Auburndale School, $2,375; Schilling & Forrest, Erie School, $1,710, Monroe School, $1,895, Parkland, $694, and Southeast Toledo, $460. The contracts total $14,590.66.

H. Kelly & Co., Minneapolis, Minn., heating and plumbing new high school in Alexandria, Minn.

Frank Spencer, Minneapolis, Minn., heating and plumbing new school building at Inkster, N. D.

Shaw & McLean, Rugby, N. D., heating school building in Knox, N. D.

W. G. McPherson Co., Portland, Ore., heating new school building at Twin Falls, Idaho.

Hess & Rau, Wessington Springs, S. D., steam heating school building at that place.

Charles C. Moore & Co., San Francisco, Cal., steam heating plant for new Palace Hotel. The contract amounts to $46,954.

P. F. Maginn & Co., Pittsburg., hot water heating residence of Edward Groetzinger.

T. J. Mooney & Co., Nashville, Tenn., steam heating Central Hospital for the Insane at Nashville; also heating Davidson County jail.

E. S. Mobley & Bros., Frederick, Md., heating Maryland Tuberculosis Hospital at Sabillasville, Md.

Monesson Foundry & Machine Co., Monesson, Pa., will furnish all of the triple-acting non-return valves for the plant of Armour & Co., Chicago. The contract amounts to $15,000.

Welch Bros., Lowell, Mass., heating Mazdaznan Temple, in that city.

Phelps & Riley, Caro, Mich., heating Caro school buildings. The contracts amount to $5,462.

Hawes & Gray, Springfield, Mass., heating Kensington Avenue school for $6,295.

Biever & Hermes, Aurora, Ill., heating new Y. M. C. A. building at that place.

Peninsula Plumbing & Heating Co., Laurium, Mich., heating and plumbing First National Bank at Norway, Mich.

Wilson Heating & Plumbing Co., Washington, Iowa, heating and plumbing new school building at Keota, Iowa.

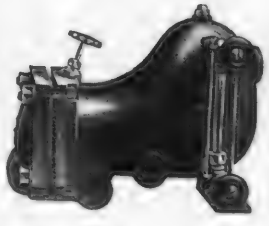
W. A. Bowers Heating Co., Milwaukee, Wis., heating $50,000 addition to Fifteenth District school building in that city.

J. Sherman & Sons, Winona, Minn., heating new parochial school at Heron Lake.

American Heating Co., Superior, Wis., heating, ventilating and plumbing power

McDaniel Improved Steam Trap

WILL DO THE WORK



When you need a Steam Trap buy one you know will work. With a McDANIEL we take all the chances. Don't pay until you are satisfied. We have been 25 years manufacturing Steam Traps and know there is no better trap made. May we send you one for trial?

Watson & McDaniel Co.

160 North 7th Street - PHILADELPHIA, PA.

Send for Catalogue

house and laundry at the county asylum. Cost, $23,500. A. Duplaise, of the South End, has the plumbing contract, at $11,-800.

C. H. Norton, Marinette, Wis., heating and plumbing new government building at that place, for $7,000.

Conger & Newton, Macomb, Ill., vacuum heating system for Union National Bank, in that place.

Weatherly & Co., Grand Rapids, Mich., heating Shepard building, in that city.

Wm. J. Telaak & Bro., Buffalo, N. Y., plumbing and hot water heating Lackawanna Steel Co.'s new buildings at West Seneca, N. Y.

F. R. Walker, Rochester, N. Y., plumbing and steam-heating the Osborn House addition in that city.

Thos. Hoye Heating Co., Milwaukee, Wis., steam-heating High School in Beaver Dam, Wis.

E. J. Harrington, Fargo, N. D., heating new school building at Cheyenne, N. D.

King Plumbing Co., Keokuk, Ia., heating First Baptist Church, that place.

Forderer Cornice Works, Mangrum & Otter and Ralston Iron Works, San Francisco, Cal., contracts for galvanized iron, heating, piping, covering, radiators, etc., for a building on Geary street, that city, at $11,700.

Monger & Monger, Los Angeles, Cal., heating and ventilating new Grammar school building at San Diego, Cal.

Willey & Calhoun, Portland, Me., heating and plumbing new Wadsworth Building containing fifty apartments.

Heatwole & Hedrick, Harrisonburg, Va., heating and plumbing new jail at Franklin, W. Va.

Johnstown Pipe Fitting Co., Johnstown, Pa., steam heating Conrad's business and apartment building, that place.

American Warming & Ventilating Co., Pittsburg, Pa., heating school building at New Castle, Pa.

P. F. Maginn & Co., Pittsburg, Pa., hot water heating a $12,000 residence at McDonald, Pa.

W. J. Valley, Pittsburg, Pa., hot water heating and plumbing large apartment building, that city.

E. W. Webster, Du Bois, Pa., steam heating for the Du Bois National Bank building.

J. N. Hartzell, Rochester, Pa., steam heating for the Beaver Valley Telephone Co.'s building.

Mangrum & Otter, San Francisco, Cal., low pressure gravity steam-heating plant in Ellen A. Fife's new building, that city.

E. D. Hough, Los Angeles, Cal., low pressure steam heating in three-story store and apartment house, that city.

E. A. Shultz, Defiance, Ohio, steam heating and plumbing the new Weston Hall for the Christian Biblical Institute, that place.

Alexander Duncan, Boston, Mass., new Augusta House, Augusta, Maine.

W. A. Stewart Co., Livermore Falls, Me., steam heating C. H. Whittemore's residence, also Pettingill Block, that place.

Natt, Boseham & McFarland, Inc., Rochester, N. Y., steam heating new Turkish Bath house, that city.

Frontier Plumbing & Heating Co., Buffalo, N. Y., heating and ventilating School No. 58.

Bartlett Bros. Co., Cleveland, O., fan heating systems for new School at Zanesville, Roosevelt and Rice Schools at Youngstown; also steam heating new Schools at Dillowale and Amherst, Ohio.

Clerkin Co., New Haven, Conn., heating and plumbing new garage for Frederick Brewster in that place.

R. H. Walker, Elmira, N. Y., heating and plumbing additions to works of the American-LaFrance Fire Engine Co. at Elmira; 20,000 square feet of wall radiation will be installed.

J-M Sectional Conduit

Reasons Why it is Better than Any Other Conduit

Will carry steam 1000 feet with practically no loss of heat.

Saves 88 per cent. of the heat lost in transmission through unprotected or poorly insulated pipes.

Is the only watertight conduit.

Acids, Gases and the action of the earth do not affect it.

Its construction makes damage to the conduit impossible from weight or movement of pipes.

Easily opened after installation and breaks in pipe readily located.

Made of same material as Portland Sewer Pipe, which has been in use over 35 years in many places.

Costs nothing for maintenance and can be taken up and relaid without injury.

Write Nearest Branch for Catalog

H. W. JOHNS-MANVILLE CO.

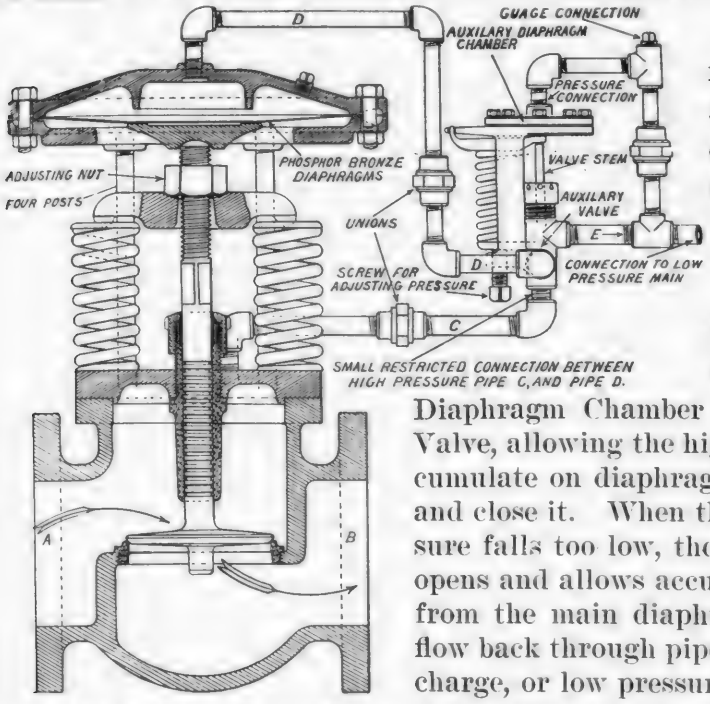
New York, Milwaukee, Chicago, Boston, Philadelphia, St. Louis, Pittsburg, Cleveland, Buffalo, Baltimore, New Orleans, Kansas City, Minneapolis, San Francisco, Los Angeles, Seattle, Dallas, London

(785)

The "CASH STANDARD" Auxiliary Operated Regulating Valve

For Very Exact Intermittent Service

BULLETIN No. 10 **IT TELLS ITS OWN STORY**



SIZES, 1 TO 10 INCHES

Auxiliary valve may be located in any accessible, convenient position.

Reduced or regulated pressure in Auxiliary Diaphragm Chamber closes Auxiliary Valve, allowing the high pressure to accumulate on diaphragm of main valve, and close it. When the regulated pressure falls too low, the Auxiliary Valve opens and allows accumulated pressure from the main diaphragm chamber to flow back through pipes D and E to discharge, or low pressure main, when the valve will again open and deliver.

Manufactured by **A. W. CASH,** 313 Market St., Newark, N. J.

THERMOSTATIC EFFICIENCY

NATIONAL REGULATOR CO.

CHICAGO
334 DEARBORN ST.

NEW YORK
12 EAST FORTY-SECOND ST.

BOUND VOLUMES OF

The Heating and Ventilating Magazine

VOL. IV FOR 1907

Suitably Bound in Cloth and Containing Full Cross Index

PRICE, Sent Postpaid to any Address in U. S., $2.50

ADDRESS

Heating and Ventilating Magazine, 1123 Broadway, New York

RECENTLY PUBLISHED

THE

Ventilation Laws

OF THE STATES OF

MASSACHUSETTS NEW JERSEY

NEW YORK PENNSYLVANIA

Comprising all the statutes now in force in this country regulating the ventilation of school and other public buildings

BOUND IN VEST POCKET SIZE

Price, 10 Cents net, or 12 Cents, Postpaid

ADDRESS THE PUBLISHERS

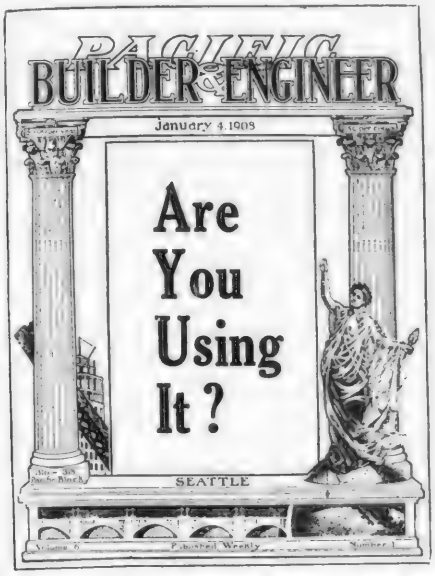
Heating and Ventilating Magazine Co., 1123 Broadway, New York

D & B LINE
The Water Way
DAILY SERVICE
BETWEEN
DETROIT AND BUFFALO
The D. & B. Line steamers leave Detroit week days at 5:00 p. m., Sundays at 4:00 p. m. (central time) and from Buffalo daily at 5:30 p. m. (eastern time) reaching their destination the next morning. Direct connections with early morning trains. Superior service and lowest rates between eastern and western states.
RAIL TICKETS AVAILABLE ON STEAMERS
All classes of tickets sold reading via Michigan Central, Wabash and Grand Trunk railways between Detroit and Buffalo in either direction will be accepted for transportation on D. & B. Line Steamers.
Send two cent stamp for illustrated pamphlet and map of Great Lakes.
Address, L. G. Lewis, G.P.A., Detroit
Detroit & Buffalo Steamboat Co.
PHILIP H. MCMILLAN, VICE-PRES. A. A. SHANTZ, GEN. MGR

Send for Our Map of Boston Showing Exact Location of

25 Suites with bath
250 Rooms newly furnished with brass beds

When you visit Boston, if you desire the greatest comfort with the least expense, you will find Hotel Rexford all right. You will notice the central location of the hotel, its nearness to the Union Station, State House, Court House, theatres, and business houses. In other words, it is a part of Beacon Hill. Of course what you want when you visit Boston is comfort and safety, and, if economy goes with it, that makes a combination that will undoubtedly prove satisfactory. Therefore, when in town, "TRY THE REXFORD" and we will make special efforts to please you.



If not, you are losing the best chance of your life of getting before the buyers of a section where business is rapidly reviving, buildings and new plants are being put up, and old equipments being overhauled and renewed. ¶ 44 pages every week of fresh Advance Information. $5.00 per year.

Send for Sample Copy—FREE.

316-A PACIFIC BLOCK, SEATTLE, U. S. A.

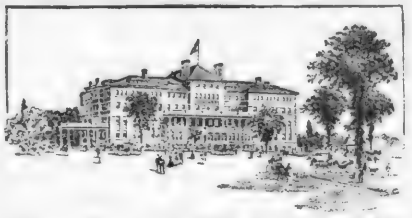
BUFFALO, N. Y.

THE

NIAGARA HOTEL

American Plan, $3.00 a Day and Upwards

Away From the City's Noise and Smoke



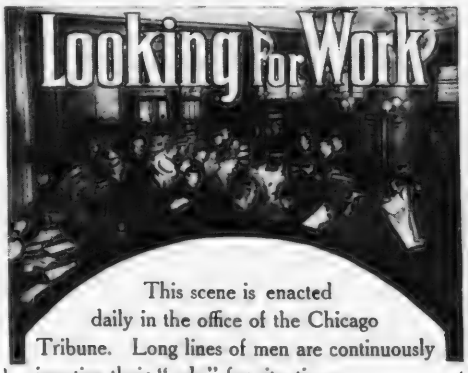
The most comfortable hotel in Buffalo. Beautiful Palm Garden. Large, airy rooms, with Bath. Two blocks from Lake Erie and Niagara River. Niagara Falls electric cars one minute from the door. Wire at our expense, or write for reservations and carriage will meet you and take you to hotel free of charge. Six minutes from down town.

Reduced Rates to Tourists, Professional and Traveling Men

SPAULDING HOTEL CO.

Mrs. C. J. SPAULDING, C. A. SPAULDING } Props.

Porter Ave. & 7th Street



This scene is enacted daily in the office of the Chicago Tribune. Long lines of men are continuously inserting their "ads" for situations.

How easily any one in this crowd could put himself forever above such a quest for insignificant, poorly paid positions!

It is only positions that require special training, special skill, special knowledge that must and do seek the man. Hundreds of such positions are advertised day after day and still cannot be satisfactorily filled.

The American School of Correspondence, Chicago, is constantly fitting thousands of young men to start life in positions where there is an assured future for a man of ambition and brains. It is taking older men from poorly paid, uncongenial work and placing them where they can secure better pay, better future, better hours and better work for the rest of their working days.

WITHOUT COST TO YOU

We will send you, without extra charge, a set of the Reference Library of "Modern Engineering Practice," in 12 volumes, Half Morocco, 6,000 pages, page size 7 x 10 inches, ***provided*** you enroll in a full course within 30 days. This is the most comprehensive and authoritative reference work on Engineering and Electricity ever published.

We employ no agents to annoy you with repeated calls at your home or place of business. The money you pay us is not used to maintain an expensive organization of high priced agents, but is used to give you better instruction at a lower cost.

Mark on the coupon the subject that interests you most, sign your name and address plainly, and mail at once.

American School of Correspondence

Div. 160, Chicago

COUPON—Clip and mail to-day

Heat. & Vent. 4—'08.

American School of Correspondence

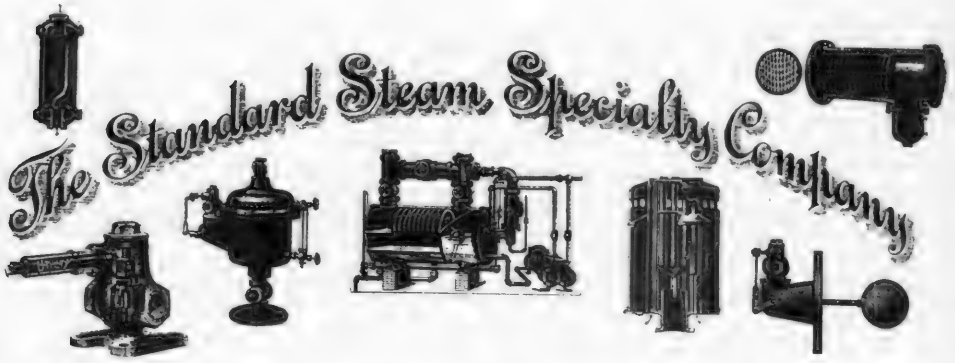
Please send me handsomely illustrated 200-page hand book of engineering information. I am interested in the course marked "X."

....HEATING, VENTILATING & PLUMBING
....STEAM AND HOT WATER FITTING
....GAS FITTING
....BOILERS AND ENGINES
....DYNAMOS AND MOTORS
....ELECTRICAL ENGINEERING
....MATHEMATICS
....MECHANICAL ENGINEERING
....MECHANICAL DRAWING
....STATIONARY ENGINEERING
....ARCHITECTURE
....HYDRAULICS
....COLLEGE PREP. COURSE

Name.....

Address.....

Occupation.....



UTILITY Exhaust Muffler, Oil Separator, Return Tank Pump Governor and Feed Water Heater

UTILITY Vertical Steam Receiver and Separator

UTILITY Pump Governor Valve and Head

UTILITY Pump Governor Valve

UTILITY Steam Separator

UTILITY Pump Governor

UTILITY Exhaust Head

Specify Utility Specialties in your work and we will guarantee their value in use.

Send for Catalogue H

542-544 WEST BROADWAY, NEW YORK

BURT S. HARRISON'S
HEAT LOSS CHARTS

¶ Enlarged copies of the Heat Loss Charts published in the November, 1907, issue of The Heating and Ventilating Magazine. Chart 1, measuring **11x21** inches; Chart 2, measuring **21x30** inches.

MOUNTED ON HEAVY PAPER.

Suitable for permanent use in the drafting and estimating room.

Price, $1.00 per set, postpaid

ADDRESS THE PUBLISHERS

The **HEATING AND VENTILATING MAGAZINE**

1123 BROADWAY **NEW YORK**

All the Advantages of the "PIERCE"

Steam and Water Boilers can not be illustrated here. Send for latest catalogues

PIERCE MARK

The "American" is one of 300 different styles and sizes of "Pierce" Boilers

INVESTIGATION WILL PROVE

that this is the most complete line of Boilers offered by any manufacturer

STEAM BOILERS		WATER BOILERS	
AMERICAN	FLORIDA	ADVANCE	MODERN
TOURAINE	FLORIDA, 1500 Series	SPENCE	ONTARIO
MODERN	IMPROVED GIANT	IMPROVED TROPIC	TROPIC, 1500 Series
IMPROVED FLORIDA		TROPIC	IMPROVED GIANT
		TOURAINE	

TANK HEATERS **LAUNDRY HEATERS**

Send for Catalogues To-Day

Pierce, Butler & Pierce Mfg. Co.

Dept. R, Syracuse, N. Y., U. S. A.

NEW YORK 254 Fourth Ave. | BOSTON 61 High St. | PHILADELPHIA 936 Arch St.

Economy of Vacuum Heating.

Water exposed to the atmosphere at sea level, boils at 212° F. In a perfect vacuum, steam may be generated at 98° F. The difference of 114° means more heat, hence more coal. Vacuum valves permit all the air to pass freely out of but prevent it from re-entering the radiators, allowing the water to boil at a temperature below normal—resulting in fuel economy.

The enemy of perfect steam heating is air in the outfit. Air goes into the system through the air valves and leaky stuffing boxes.

The Norwall Automatic Air and Vacuum Valves, combined with the Norwall Packless Radiator Valves, allow the air to pass out and automatically assist to keep it out, cutting the fuel expense from 15% to 20%. Write for particulars.

THE NORWALL PACKLESS RADIATOR VALVES

AMERICAN & IDEAL RADIATORS & BOILERS

AMERICAN RADIATOR COMPANY

General Offices: 282-284 Michigan Ave., Chicago

NEW YORK	CINCINNATI	CLEVELAND	OMAHA	BRANTFORD
BOSTON	ATLANTA	INDIANAPOLIS	KANSAS CITY	LONDON, E. C.
PHILADELPHIA	DETROIT	ST. LOUIS	DENVER	PARIS
BUFFALO	CHICAGO	MEMPHIS	SAN FRANCISCO	BERLIN
PITTSBURG	MILWAUKEE	MINNEAPOLIS	SEATTLE	